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Achieving Greater Consistency between Subjective and Objective Risks

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In the context of a hypothetical Superfund site (or abandoned hazardous waste facility), this research examines strategies for achieving a closer match between risk estimates by citizens and those by scientists. A stratefied sample was interviewed to represent environmental groups, business, civic activists, elected officials, and general population. Respondents were given a scenario about contamination of drinking water from the Superfund site. The scenarios varied in that some included an uncertainty disclaimer. The other variation was in terms of how much citizen participation would be involved in decisions about remedial action, or whether the state would purchase homes that could not be sold at a price representing market value before discovery of the site. Respondents were asked about their level of concern, their perceived risk, and any actions they would take if they lived near the hypothetical site.

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ACHIEVING GREATER CONSISTENCY BETWEEN SUBJECTIVE AND OBJECTIVE RISKS

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EXECUTIVE SUMMARY

The purpose of this research is to learn what risk communication strategies can achieve greater consistency between the subjective risk estimates of citizens and the objective risk estimates derived by experts.

The Research Process

In 1988, interviews with 174 adults were conducted in a county that had neither a highly publicized Superfund site nor other dramatic hazardous waste controversies. The sample was stratified to include members of environmental groups, business persons, civic activists, and elected officials as well as a segment from the general population.

Each interview began with questions about the respondent's concerns with hazardous waste, risk estimates of health problems caused by hazardous waste sites, prior involvements in waste issues, and information about chemical waste matters. Then, respondents were asked to imagine themselves living within one mile of a Superfund site. They read a typical Superfund scenario including a response action, an EPA water advisory notice that small amounts of some contaminant had gotten into the water supply, the formation of a concerned citizens group, and eventually the cleanup of the site and its removal from the National Priorities List. The description of the site included pictures of leaking 50 gallon drums and technicians in protective clothing taking samples.

The scenario provided to half of the respondents included an uncertainty disclaimer with the water advisory notice. The disclaimer is a paragraph explaining that the risk estimates in the water advisory notice are very cautious estimates based on extrapolations from animal studies. The point is made that scientists attempt to overestimate rather than underestimate the risk. The other half of the sample did not receive this disclaimer.

One-third of the respondents read a management option that included enhanced citizen participation through EPA agreeing to work closely with a citizen advisory committee at all stages of the remedial action. Another third of the respondents received an indemnification management option that involved the State agreeing to purchase the home of anyone within one mile of the site at the fair market value prior to identification of the hazardous waste problem. The final third of the sample received the standard EPA management procedures including giving a technical assistance grant to a citizens' group and holding public hearings.

After reading the material, the respondents were asked to record their level of concern from living near the site, health risk estimates, comparisons of the risk from living near the site with other voluntary (e.g., smoking) and involuntary (e.g., eating fruit sprayed with insecticides) risks, and actions they would take if faced with this type of situation.

Concern is High and Risks Overestimated

Levels of concern were uniformly high, even after the cleanup. In the health risk estimates and the comparative risk estimates, most respondents severely overestimated the risks from living near the site. Most said they definitely would take some action such as using bottled water, contacting Congress, or even leaving the area.

The four subsamples (members of environmental groups, civic leaders, elected officials, and business people) are quite similar on all of these measures. Elected officials are more trusting of everyone, not just themselves, but the similarities are more striking than the differences. When faced with a response action, almost everyone seems to become an "environmentalist."

Essentially the risk communication and management options have only a slight impact on consistency between subjective and objective risk estimates. Providing the uncertainty disclaimer has a slight tendency to increase message credibility, and therefore trust, for some respondents. The availability of indemnification, however, does not reduce concerns and health risk estimates, but actually increases them somewhat. Providing indemnification signals to some respondents that the situation is so serious that their health is in immediate danger.

Prior Attitudes, Trust, and Respondent Characteristics Important

Other factors account for much of the variance in how people view a hazardous waste situation. Three sets of variables account for risk estimates: prior attitudes about, and involvement with, hazardous waste; trust; and demographics such as gender and education.

Level of concern correlates strongly and negatively with two scales: trusting local officials and industries; and trusting state and national agencies. State and federal officials are trusted more than local officials. The key finding is that many people view local government officials as working closely with local hazardous waste generators, and see other levels of government on a different dimension. People who do not trust local officials to tell them the truth are overly concerned with living near the site. Because a majority of respondents would not trust local officials in this matter, there are high levels of concern with living near the site.

Health risk assessments also vary with the trust variables, but gender and education are also important determinants. Women and the less well educated are much more likely to overestimate their chances of suffering illness from the site.

In comparing the risk of living near the site with voluntary risks such as smoking, women, those with less education, and those who express less trust judge the site as more risky. For the comparison with involuntary risks such as eating fruit treated with chemicals, those with less education and those who express less trust judge the site as more risky.

Respondents stated that they would take actions including getting more information, using bottled water, leaving the area, and contacting Congress to put pressure on EPA. Intent to become involved at the level of actions requiring the least commitment (e.g., talking, serving on a committee) correlates strongly with great concern with toxic waste before learning of the particulars of the hypothetical case. Personal actions, such as using bottled water or leaving the area, correlates most with distrust of local officials, low education, and feminine gender. Convincing others to become involved or to use bottled water relates strongly to high levels of concern with toxic waste issues recorded before the hypothetical case was presented. Finally, political actions (e.g., contacting Congress, organizing a protest meeting) again correlates most strongly with prior concerns and issue involvements. For talking, involving others, and political actions, exposure to the indemnification option has a slight, yet statistically significant, impact on encouraging those actions.

Poor risk estimates seem to be generated more by distrust than by anything else, although less education and feminine gender also have independent impacts. The intention to take personal action to protect one's health (e.g., buy bottled water) also seems generated by these same variables. However, the other actions (talking, involving others, and political) come more out of a history of concern with hazardous waste and involvement in hazardous waste issues prior to this hypothetical case.

Problems in Communicating Risks to a Distrusting Public

The problem for EPA in devising a strategy to achieve greater consistency between subjective and objective risk estimates is that many key predictor variables - trust in local officials, gender, education, prior attitudes and involvements - are factors that are difficult or impossible to control by means of a simple risk communication program. There are strategies, however, that appear worthy of more attention.

Trust is very important. The most cleverly crafted risk messages are unlikely to overcome distrust. Distrust is a function of many factors, some which the agency has a certain degree of control over and others which it can do little about. Our respondents, in open-ended questions and group discussions, indicate that three site-related factors promote distrust:

*a general lack of understanding of the cleanup process as well as problems in risk estimation;

*mixed messages - official communications tend to define the risk as manageable and minimal while the behavior and costumes of the agency personnel, and possibly the sights and smells characterizing the site itself, indicate that it is very dangerous; and,

- *the communication network tends to focus too heavily on local officials and notables, who tend to engender little trust in situations like these, and not enough on local residents.

Implications for Policy

A number of recommendations follow from our analysis.

*The public needs a better understanding of the risk cleanup process and constraints on the agency so that their expectations more closely match reality. Educating about waste cleanup may be as important as educating about the characterisitcs of the risk.

*Educating about risk and the cleanup process should begin as soon as the agency begins its involvement in the community. The agency can prepare some generic material, in laypersons' terms, about what is involved in a cleanup action and probable time frames. Locals should also be informed about the sampling and testing process, the rationale for the protective clothing used by technicians, and why determining risk takes time.

*Agency personnel must be made aware that virtually every act and pronouncement is viewed as a statement about relative risk. Programs designed to elicit good will may actually be perceived as indicating high risk.

*Information and education programs cannot focus only on local officials and notables. These people do not enjoy high credibility and tend not to be tied into crucial information networks. Information- education programs are probably more effective at the neighborhood level.

*It appears that the average citizen is not being adequately prepared to make risk decisions in modern technological society. There appears to be a need for a broad public information program about environmental risks that can help citizens make their own risk management judgments. Given the increasing need for citizens to pass judgment on difficult trade-off options, it seems appropriate to bring such science, technology, and society training early to a person's educational experience. Such a program of dispensing objective risk information is consistent with the purposes and legislative history of CERCLA and SARA.

Limitations to this Research

Any individual piece of research has significant limitations and shortcomings. The research reported here is no exception. Two problems require mention: problems with the stimulus materials and sample size limitations.

It is possible that the reason the hypothetical site information had so little impact is that the differences between the manipulations were not dramatic enough. Events at an actual site take place over time and are often highly dramatized by the media. A study of this type cannot duplicate the reality of an ongoing site conflict. Respondents provided feedback indicating that once they had seen the pictures with the rotting 50 gallon drums and the technicians in protective clothing their attitudes were formed. The management scenerios and the risk messages were processed through a lens colored darkly by the initial information.

While the sample size is adequate for some analyses it is too small for robust subgroup analysis. Therefore, subgroup analyses must be viewed as suggestive and judged in the context of overall patterns and other available research findings.

SECTION I: INTRODUCTION

The goal of the research reported here is to provide information useful for designing a risk communication strategy that will reduce disjunctions between perceived and objective risk levels. In addition, the hope is that these results will further the EPA's goal of helping citizens make their own risk management decisions (Fisher, 1987).

This report is comprised of a series of topics that lead the reader into the study, describe the study itself, present the results of the analysis, and discuss the implications for risk communication.

Section II, "Risk Communication," is an overview and critique of the risk perception-risk communication literature. This section raises questions about the ability of past research to answer the questions that risk communicators ask. It is generally assumed that formal risk communication is important, but, in fact, there are well-founded reasons to question that assumption. Other factors may be more important in structuring public reactions to Superfund situations. Hypotheses suggesting these other factors are presented at the end of this section.

Section III, "Research Design and Measures," presents a discussion of the research design, the key concepts, and the construction of measures to represent the concepts. The quasi-experimental design and its rationale are discussed in detail. "Before" and "after" attitude, belief, and behavioral intention measures are outlined.

Section IV, "Sampling and Implementing the Survey," describes the sampling procedure and how the survey was implemented. The actual sample is considerably larger than initially proposed and selected to reflect the range of social groupings central to community responses to toxic waste threats. The sample includes environmentalists, business persons, civic activists, elected officials, and working class people. An approximately even mix of males and females was sampled.

Section V, "Prior Attitudes, Issue Involvement, and Information," delineates the results of the pre-manipulation measures of general and specific levels of concern and estimates of the health effects of exposure to man-made toxins. These items are essential in assessing the impact of the risk communication and the degree of correspondence between objective and subjective risk. In addition, levels of, and sources of, knowledge about toxic chemicals are tapped by multiple measures.

Section VI, "Trust," presents the results of the analysis of the various items assessing trust. Trust is an essential component of the communicator credibility problem. If communicators are not trusted, then the quality or format of the risk information is meaningless. Distrust means disbelief. Measures of trust in local, state, and federal governments, industry, and science are included in this research.

Section VII, "The Hypothetical Site: Levels of Concern," constitutes the results of questions asking respondents how concerned they would be living within one mile of the site both before and after completion of the cleanup. This comparison provides one measure of the credibility of the cleanup scenario. Various categories of respondents are explored for variations in pre- and post-cleanup levels of concern.

Section VIII, "The Hypothetical Site: Health Risk Assessments," also examines judgments both before and after the cleanup. This section, however, focuses on the issue of perceived health risks to self and family. Again, variations in health risk concerns are compared across categories of respondents.

Section IX, "The Hypothetical Site: Comparative Risk Assessments," presents the data related to the relative accuracy of the individual's risk assessments. Respondents make judgments on how risky living near the waste site is in comparison to a number of voluntary and involuntary risks: smoking, living near a nuclear power plant, driving a car, riding a bicycle, chest x-rays, and eating fruit sprayed with pesticides. Both pre- and post-cleanup judgments are made. Besides providing a measure of relative accuracy, this procedure provides another index of the respondent's faith in the cleanup scenario. These judgments are related to the respondents' demographic characteristics.

Section X, "The Hypothetical Site: Behavioral Intentions," describes the distributions of responses to various behavioral options one might take in a situation such as that described in the hypothetical situation. These options range from those that demand very little personal sacrifice or involvement to those that demand putting one's self on the line in a public situation. Fifteen of the behavioral options effectively scale into four subscales that can be logically interpreted. These scales and their relationships to respondent characteristics are discussed.

Section XI, "Explaining the Results: Bivariate Relationships," examines the factors that relate to four sets of variables designated as dependent variables in this research: levels of concern, health risk assessments, comparative risk assessments, and behavioral intentions. This section sets the stage for understanding the complex pattern of relationships that characterize the overall results.

Section XII, "Explaining the Results: Multivariate Analysis," presents a series of stepwise multiple regressions that provide estimates of the relative contribution of a substantial number of independent variables on the dependent variables noted above. The independent variables that account for the most variance in the dependent variables change with the dependent variable being analyzed. The pattern of responses, although not what was originally expected, is consistent enough to generate a reasonable interpretation.

Section XIII, "Responses to Open Ended Questions," is an overview of what the respondents wrote in answer to a number of open-ended questions. Respondents were asked about their reactions to the hypothetical situation, the management scenerios, and the risk communication itself.

Their responses are instructive and add further weight to our interpretations of the structured questionnaire results.

Section XIV, "Summary and Implications for Risk Communications," is a discussion of the major findings and what they say about communicating risks in Superfund-like situations.

SECTION II: RISK COMMUNICATION

"Because of the complexity of risk communications and the subtlety of human response to them, it is extremely difficult, a priori, to know whether a particular message will adequately inform its recipients" (Covello, et.al., 1987: 31).

" ...risk communications in their social context resemble tangled webs, in contrast to parallel series of sender/receiver interactions" (Krimsky & Plough, 1988: 298-299).

Introduction

There presently exist several excellent reviews, of both a theoretical and practical nature, of the risk communication literature (Covello, et.al., 1987; Covello, et.al, 1988). These reviews guide the reader through the morass of materials that bear, in widely divergent ways and with differing degrees of applicability, on the risk communication issue. It is not the intent of this chapter to simply reproduce those discussions. Instead, the focus will be on generic problems plaguing the very concept of risk communication, the difficulty in doing research to answer the kinds of questions risk communicators ask, and how the research reported here is designed to address a subset of these problems.

First, the major threads characterizing research on risk communication will be discussed and their relative contributions highlighted. Then, the basic assumptions of the risk communications enterprise will be reviewed and their difficulties noted. Finally, the implications for research on risk communications will be discussed and cast into the framework of the research to be reported here.

It is absolutely essential to keep in mind that this report is concerned with a particular type, and context, of risk:

> THOSE SITUATIONS IN WHICH A SOMEWHAT HISTORICALLY AND SOCIALLY UNIQUE COMMUNITY FACES AN IMPOSED, MAN-MADE, DREADED SUBSTANCE THAT IS GENERALLY CHARACTERIZED AS SOMEWHAT ENVIRONMENTALLY UBIQUITOUS, OFTEN HAVING MULTIPLE EXPOSURE POSSIBILITIES, BEING DIFFICULT TO ELIMINATE EASILY OR COMPLETELY, AND HIGH SCIENTIFIC UNCERTAINTY RELATIVE TO EXPOSURE AND LONG-TERM IMPACT.

This is the nature of most Superfund situations. We specifically bound the problem in this way to make it clear that the communications difficulties in this situation may be quite distinct from those situations in which a communicator is attempting to mobilize people in the face of an imminent and known risk (hurricane), a natural risk characterized by some uncertainty in terms of long-term impact (radon), or a self-selected risk characterized by somewhat complex risk-benefit outcomes (a new drug). Communication effectiveness in the latter cases is usually defined in terms of number of people mobilized to take recommended actions while in the Superfund case effectiveness is viewed as the "appropriate" intensity of community response. "Appropriate" is a judgment made by the sponsoring government agency and is at least as political in nature as it is scientific.

Risk Communication: What Do We Know

The emerging subdiscipline of risk communication has evolved from the following:

* the attitude change research from psychology, social psychology, and marketing;

* the work on decision-making and heuristics from cognitive psychology, and to a lesser extent, micro-economics;

* research on risk estimation being done primarily by psychologists;

* research on the impacts of the mass communication media;

* case study research and theorizing emphasizing the social-cultural context of risk; and

* the recorded accumulation of the experience of those charged with risk communication responsibilities in actual field situations.

Most literature reviews have somewhat uncritically combined insights gleaned from these diverse sources. This is to be expected, and is a valuable contribution, in the formative stages of an intellectual endeavor. However, the combinatorial process tends to neglect serious questions of suitability and actual substantive contribution. While a thorough critique is well beyond the scope of this chapter there are some relatively obvious points that need to be made.

The Attitude Change Tradition

The attitude change literature in social psychology has gelled into a number of concise principles that can be found in most introductory textbooks. This research exhibits the following characteristics:

* it is done in laboratories using college students as subjects;

* it generally explores the impact of a single independent variable on some measure of attitude change;

* it involves topics that engender little emotional involvement or the level of emotional involvement goes unmeasured;

* the research situation precludes social influence;

* the topic seldom involves risk of any kind;

* the results tend to reflect very small changes in attitudes;

* and, the behavioral outcomes of the change are unknown.

The aphorisms generated by this research deal with aspects of the communicator, the communication, and the audience. This research tradition is tied to Carl Hovland and the Yale Communication Program which began in the late 1940's (Hovland, et.al, 1949). Basically, they tell us that the communicator should be trusted, interesting, and attractive; messages should be at the appropriate level of complexity, clear, use audience arousing devices but make sure they are not aroused inappropriately or at too high a level; if the audience is somewhat highly educated and heterogeneous then messages should be presented in different ways and include multiple perspectives so that audience members perceive an attempt at objectivity.

The shortcomings of this body of literature, especially as it pertains to the risk communication problem, should be obvious. In contrast to the typical attitude change experiment, communication at Superfund sites tends to be in an emotionally charged atmosphere, there are multiple communicators and message channels, the focal issue has a history and and this translates into preexisting attitudes that act as filters for incoming information, the "official" communicator represents a government agency that may have less than total public confidence, the topic is complex and characterized by enough uncertainty to generate mixed evaluations even from experts, information transmission and interpretation involves ongoing social networks, and the message recipients have the power to choose which information they want to expose themselves to. In this communication atmosphere the above noted aphorisms are little better than basic common sense.

The Cognitive Heuristics Tradition

The work on decision-making and problem solving heuristics, at least that part of it applied to risk information processing, has centered on typical departures from statistical "rationality." The leaders in this tradition are Kahneman, et. al, (1982). Generally, people fail to take sample size, population characteristics, and objective odds into account in their decision making. Furthermore, in low probability, high risk situations, people tend to anchor on the negative outcome and adjust insufficiently downward for the low probability. McClelland, et. al., (1986) indicate that there may be two modal responses to low probability, high risk, situations: some people focus on the low probability and dismiss the risk as not worth worrying about and others focus on the outcome and become overconcerned. The determinants of these different decision making styles are unknown.

This body of research shares some of the problems noted in the attitude change research. It tends to be laboratory research characterized by the following: a single, low-involvement, issue to be judged in an atmosphere free of social interaction and pressure. The principle generalization, that people do not make decisions the way an ideal statistical thinker would, should come as little surprise and, at least to this point, has not translated into solid recommendations for improved risk communication. However, knowing that people tend to focus on the outcome of a given risk and adjust insufficiently provides some guidance on message construction if it is known which outcome people are likely to use as an anchor. In the "tangled webs" of risk communication at actual Superfund sites, the anchors, or benchmarks, that people use in risk estimation may "float" to some degree as mixed messages are received from the media, the experts, and interpersonal communication networks. Further research is needed to bridge the gap between an understanding of how people make decisions in highly controlled, laboratory situations and how they utilize multiple channels and messages in complex, shifting, situations.

While the literature on decision making biases and judgmental heuristics is stimulating and interesting, it provides limited useful information about effective risk communication (Perrow, 1984).

The "Rating the Risks" Tradition

A number of psychologists from the decision heuristics school have applied that perspective specifically to individual biases in risk estimation. This is the "rating the risks" tradition of research which applies psychometric methods, using paper and pencil tests, to very limited samples of people. Psychometric methods ask subjects to compare objects or concepts using their own, individual, anchors or benchmarks for comparison. These researchers also have generated a set of principles that have become dogma in the risk perception literature. The following are the most frequently repeated aphorisms:

*events that are highly imaginable and memorable, which have a high likelihood of being fatal, and high catastrophic potential are more likely to be feared (Slovic, Fishhoff, Lichtenstein, 1979);

*things that are unobservable, unknown, new, and have delayed consequences are more likely to be feared (Slovic, 1987);

*the limited power of peoples' information processing capabilities tends to result in overconfidence, in erroneous decisions, and a desire for certainty (Fischhoff, 1981);

*presenting relative risks in a comparative format enhances understanding but may mobilize negative reactions if the comparisons appear specious or manipulative (Covello, et.al, 1987).

*events that have "high signal potential" (somewhat insignificant events that are interpreted as indicating the potential for future catastrophe), such as a small accident in an unfamiliar and feared system, will increase fears dramatically (Slovic, 1987);

*greater risk is tolerated if that risk is voluntary, immediate, known precisely, and controllable (Fischhoff, et.al., 1978);

*people respond to problems as they see them not as they are (Fischhoff, 1981);

*new information will be assimilated to fit existing attitudes (Slovic, et.al., 1979); and,

*risks distributed unequitably tend to generate more outrage (Slovic, et.al., 1980).

While the above noted body of literature has certainly increased our knowledge of judgmental biases in certain kinds of risk decisions the implications for risk communication are unclear. These same authors go on to note that the perception and acceptance of risk is rooted in social and cultural factors (Slovic, 1987). Because it is difficult to manipulate these social and cultural factors or the imaginability, memorability, likelihood of fatality, catastrophic potential, signal potential, or voluntariness of a given risk in a risk communication program, we have limited scientific information to guide the risk communicator. In fact, each of these factors is open to social-definitional processes: these qualities are not inherent in a stimulus or configuration of stimuli, they are created in the process of communication itself. Risk communicators can, and should, provide information that helps the community understand the scientific backround for agency decisions and the cleanup process itself, but many of the critical variables that influence individual decision making are beyond the control of the risk communicator. This is one reason that equity issues demand attention. Addressing equity concerns has the potential to temper opposition based on unreasonable fears.

The Impact of the Mass Media

Research dealing with the impact of the mass communication media on the perception of risk produces consistent generalizations:

*balanced media coverage of man-made risk situations is unlikely since the criteria for newsworthiness tends to be conflict, drama, human interest, negativism, photographability, exclusivity, and newness (Peltu,1987).

In a recent analysis of network evening news, Greenberg, et.al.(1988) basically reiterate the above noted quote:

> "Risk as calculated by scientists had little to do with the amount of coverage provided by the three networks' evening news broadcasts. Instead, the networks appear to be using the traditional journalistic determinants of news (timeliness, proximity, prominence, consequence, and human interest) plus the broadcast criterion of visual impact to determine the degree of coverage of risk issues."(p. 28)

Because "news," by definition, requires acute incidences to promote public attention, the long-term nature of Superfund problems and the nature of the information needed to understand the problem generate little public interest. On the other hand, if corporate malfeasance can be linked to the waste problem, or if there appears to be an unusual local incidence of cancer, or if a "save the children" group arises,these constitute "news." While Sandman (1986) and others have made suggestions for improved communication between sponsoring agencies and newspeople there is little reason to suspect that scientific-technical debates over chronic risks will soon dominate newspaper and television coverage. Even if such debates were included in the major media it is highly doubtful that many people would pay them any attention. More important, given the scientific uncertainty surrounding risk estimates and estimates of cleanup efficacy, experts with credentials can always be found to provide a countering view. The role of the media in risk communication is not likely to change significantly in the near future.

The Socio-Cultural Tradition

The public's understanding and reaction to risk also has been approached from a socio-cultural perspective. Douglas and Wildavsky (1982) contend that Americans view the world as frightening and increasingly risky in spite of significant real increases in health and longevity. They link this pessimistic view to an interaction between cultural notions of purity and progress and the realities of conflicting interests generated by multiple lifestyles and organizational affiliations. Others would point to the growing "evidence" that modern technology, generally promoted by big business, developed by corporate science, and regulated by big government, is beyond the scope of ordinary understanding and ordinary control and management (Perrow,1987). Bronstein (1987:223) presents this perspective succinctly:

> "...the verified existence of a risk is not sufficient for the the danger to be publicly recognized... The public understanding of danger bears only a tangential relationship to the objective evaluation of the riskiness of the substance, but a close relationship to the political impact of identifying the risk."

In other words, risk identification and public reaction to risk may be viewed as a challenge to existing institutions rather than an imperfect digestion of information on risk. This perspective helps us to understand why public reactions to risk situations tend to take on all the elements of social movement development (Gerlach, 1987). Risk estimation and communication can be viewed as driven by the demands of a modern protest movement. From this perspective there is little likelihood of ever being able to satisfy the most vocal elements of the contentious "public." Every response from agencies to demands for more and better information can be challenged as inadequate and result in a new set of demands. Furthermore, the increasingly litigious nature of modern America almost insures that a significant subset of environmental risk situations will wind up in protracted court deliberations (Jasanoff, 1987).

From a socio-cultural perspective, there is little reason to expect that modifications in risk estimation procedures and improvements in communicating technical information will result in more "appropriate" public reactions to risk, especially the chronic, low probability kind defined earlier in this chapter. The uncertainty inherent in estimating risks of this kind provides the ideal context for social-definitional processes to dominate (Scott, 1988; Tarr, 1987; Sharlin, 1987; Mazur, 1981). The social construction of risk provides a symbolic representation of culture and interest based conflicts. This perspective helps us understand why some Love Canal residents downplayed the riskiness of the uncontrolled chemicals and others saw it as an unmitigated disaster. Their reactions had little to do with underlying cognitive heuristics, the nature of the scientific/technical information provided, communicator credibility, or the strangeness and dread engendered by knowledge of the substances. Their reactions reflected the major interests encompassed by their key roles and stage in life-cycle. Those with young children and unpaid mortages despaired and fled while those nearing retirement and hoping to sell their property saw little need to panic (Fowlkes, 1987). Similarly, if an affected public strongly desires the use of land officially defined as "contaminated" they are unlikely to exhibit much fear in the face of technical risk messages (Gale, 1987). The socio-cultural perspective argues that the symbolic-political aspects of risk communication are more central to the nature of public reactions than the scientific credibility of the messages or simple message construction variations.

The Experience of Practitioners

A related theme characterizes the recorded experience of many of those who have spent time on environmental risk "firing lines." In personal interviews with several EPA community relations people, including some toxicologists, the following points were reiterated:

*there is very little public demand for general scientific-technical information; and,

*information demands and public reactions vary significantly from case to case.

These practioners had a readily available corpus of specific examples to "prove" that, even under the most carefully managed conditions, people had very little interest in the chemical properties of the substances defined as problematic or the abstract prognostications about possible outcomes. Local people want to know if they are personally being exposed to the substance, whether or not it poses a clear and present danger, and what is being done to get rid of it (immediately, if possible). Community differentials in reactions to Superfund sites were viewed as more closely related to local socio-political history than any objective characteristics of the risk (Fitchen, et. al., 1987).

Conclusions: What Do We Know About Risk Communication?

The above discussion indicates that much of the research that is meant to bear on the issue of risk communication is structured in ways that make generalizations to real risk communication settings extremely tenuous. Studies done in somewhat sterile laboratory environments using low or noninvolving stimuli in nonsocial situations tell use little about the structuring of public reactions in real life situations. Furthermore, the aphorisms generated by such research are of such generality, even being contradictory, that applying them in actual risk communication situations is little more than the application of common sense judgment.

Studies of how human decision making departs from statistical rationality also do little to inform the risk communicator. To know that people do not approach low probability, potentially deadly outcome events the way an expert would says nothing about how to lead them to think like a statistician. Since it is extremely difficult to get students to think statistically even after several statistics courses it seems unlikely that the general public can be so trained within the temporal parameters of a real risk event.

Social and cultural approaches to risk communication sensitize us to the possibility that public reactions may have relatively little to do with actual risk messages per but a great deal to do with issues of public trust and social-definitional dynamics. In actuality, risk communicators in the field are pointing to basically the same phenomena.

Implications for this Research

It is understandble that EPA seeks a better fit between "objective" risk estimates and public reaction. It is also logical that the area of risk communication be targeted as central in pursuing that end. However, it must be realized that some very fundamental issues in risk communication have either been underresearched or not researched at all. Most importantly, little has been done on the actual market for risk communication information. We know, for example, that even educated people are generally poorly informed on most issues and that many factors compete for people's time and attention. The current policy trend that emphasizes education and information as a solution to many social problems is based less on any evidence of the efficacy of such approaches than on the political reality that modern American society, which stresses individual autonomy and decision making, leaves no other functional possibility. Also, existing risk communication research does little to inform us about the relative impact of risk communication, per se, on public reactions. The research reported here is designed to take a first step in answering those questions.

Public Response and Risk Communication

Public response is a function of multiple factors, of which risk messages may play a relatively minor part (Armour,1987; Bord, 1987; Krimsky & Plough, 1988). Certainly risk information plays some role in shaping perceived threats to health and safety. However, this information can come from official and unofficial sources, be unevenly distributed in a given community, and vary in terms of its technical/scientific accuracy. A number of other factors may have an equal or greater impact on public reaction: the restriction of land use, the threat of property devaluation, community stigmatization, possible decreases in community economic potential, possible out-migration, chronic stress, and other social-definitional problems that do not lend themselves readily to quantification. These are the kinds of factors that the typical risk communication does not attempt to deal with. An impressive body of research points to four major sources of concern for residents facing situations such as Superfund Sites (Armour, 1987):

*perceived risk as shaped by official and unofficial information on the characteristics of of the toxic substances (it is important to realize that the mere presence of the EPA specialists may be sufficient "data" to trigger high concern);

*perceived inequities in the distribution of costs and benefits (anger in being singled out for such nefarious treatment);

*feelings of loss of control over forces affecting the quality of one's life and community;

*and, a general lack of trust in big business and big government.

Ideally, perceived risk should vary somewhat with the amount and quality of risk information reaching local citizens. The problems of perceived inequities could be approached with some sort of compensation package, this option is presently not available at Superfund sites. Feelings of loss of control and an absence of trust may be ameliorated by some sort of intensive public participation program: much depends on the depth of the lack of trust. The central problem addressed by this research can now be stated:

*what is the relative impact of risk communication variates, equity enhancing variates, and local control and trust variates in shaping people's judgements about reactions to a Superfund type situation.

The complexity of the above problem is magnified by the possibility that all these factors vary by some poorly understood personality and demographic-personality characteristics.

The following hypotheses, based on the above analysis, our own research on fear of radioactive waste (Bord, 1985) and the experience of others faced with the problems of siting risky facilities (Armour, 1987), guide the research to be subsequently discussed:

*risk communication per se has relatively little to do with structuring reactions to Superfund-like situations;

*compensation designed to redress perceived inequities will have a greater impact on reactions than risk information but that impact is also small;

*control-granting options will have a greater impact than either risk communication factors or compensation;

- *individual variations in beliefs and socio-institutional attachments will have the greatest impact on reactions to Superfund-like situations.

While this research is at best a preliminary first step, its implications may be revolutionary for agencies like EPA. The next chapter outlines the translation of the above abstractions into operational processes.

SECTION III
Research Design and Measures

Introduction

Risk communication at actual Superfund sites is a complex process. There are multiple sources, multiple messages, and audiences. These may change at any time given new information or input from ad hoc groups that are successful in getting attention. Research in actual Superfund settings is valuable but has problems of interpretation due to the lack of researcher control over the stream of events. On the other hand, carefully controlled research on risk perception and communication tends to totally eliminate the very features that define an actual risk communication situation. The study reported here is an attempt to straddle those two research extremes. A quasi-experimental design was selected so that somewhat complex stimuli could be presented in a somewhat controlled fashion. A hypothetical situation was presented in a questionnaire/interview format along with pretest and postest questions.

Several considerations guided the design of this research. First, the goal was to put research subjects in as realistic a situation as possible. Second, given the research hypotheses, the exogenous (independent) variables had to include differences in risk message characteristics and differences in compensation and involvement-in-decision-making options offered to those facing the hypothetical risk. Third, measures had to be constucted for beliefs and cultural understandings that past research has suggested are important. Fourth, there had to be a way to measure crucial individual characteristics that could cause different responses to risk messages. Finally, respondent reactions to the matrix of information provided had to be assessed to give guidance on the effectiveness of the manipulation and insights into subtle, perhaps unmeasured factors influencing their responses.

The Quasi-Experimental Design

The following diagram illustrates the quasi-experimental design:

A Hypothetical Superfund Situation With Subjects Instructed to Imagine Living Within One Mile of the Site

Risk Communication I	Risk Communication II
A Comparative Risk Communication Emphasizing the Uncertainty Inherent in Risk Estimates	A Comparative Risk Communication Not Emphasizing the Uncertainty Inherent in Risk Estimates
The Management Scenerios	**The Management Scenerios**
Management Scenario I: Standard	Management Scenario I: Standard
Management Scenerio II: Enhanced Citizen Participation	Management Scenerio II: Enhanced Citizen Participation
Management Scenerio III: Indemnification	Management Scenerio III: Indemnification

As presented above, the design is a simple two-way analysis of variance with two categories in one variable and three categories in the other. However, as noted in the research proposal, this study is an attempt to ferret out the more important factors making up peoples' decisions vis a vis risk communication at Superfund sites. As such, it has an exploratory nature as well as the quasi-experimental nature diagrammed above. A number of attitudinal factors are included as well as demographic variates. This implies that the analysis will incorporate correlational techniques as well as analysis of variance techniques. While a multitude of uncontrolled variables subtracts from the degree of control, there is enough known about possible impacts to make reasonable inferences, especially if the results are strong and/or consistent. The next section describes the design in greater detail.

The Hypothetical Situation

Two elements comprised the attempt to create a realistic Superfund situation:

*instructions to the respondent that, in effect, asked him or her to role-play the part of someone living within one mile of the source of a toxic waste problem (See Appendix A); and

*a realistic scenerio that included pictures of decaying 50 gallon drums and people in protective clothing collecting samples (See Appendix A).

The scenerio was constructed so as to include some of the routine features of a Superfund situation. Attention to a possible problem was created by locals noticing that the drinking water had an "unusual" smell and the local newspaper reporting letters from concerned citizens who linked possible health problems with the smelly water. The list of health problems included one family experiencing an unexplained rash, two new cases of childhood lukemia in the same neighborhood, and a growing number of old people reporting problems with arthritis. Note that the relative ambiguity inherent in these stimuli parallels the ambiguity usually present is real situations. The water had an "unusual," not "bad," smell and the reported health problems are well within the range of routine health problems that could be found anywhere.

Repondents are then told that local officials contacted the State Department of Environmental Resources (DER) which proceeded to conduct tests revealing benzene and trichlorethylene levels in drinking water above those recommended by the Environmental Protection Agency (EPA). The source of the contamination is identified as an abandoned manufacturing plant which has several waste lagoons and decaying metal drums on the property (a picture is included). The EPA is called in, technicians take samples, construct a temporary holding lagoon, and fence off the area and post signs (a picture is included). This sequence of events is similar to those characterizing the beginning stages of many Superfund sites.

Constructing the Exogenous Variables

The Risk Communication

Although the uncertainty characterizing risk assessment is frequently alluded to there has been little systematic research on variations in information about uncertainty and reactions to risk communication. On the one hand, cognitive psychologists tell us that people desire certainty and that information indicating less-than-perfect knowledge is upsetting to those who do not fully understand the nature of science. On the other hand, the admission of limits to knowledge, by those experts representing government agencies, could have the effect of increasing their credibility. Perhaps the strategy of projecting the image of the omniscient scientist raises totally unrealistic expectations that must be eventually dashed. Research on social movements indicates that raising expectations can be an important step in the creation of a rebellious public. An admission of uncertainty versus the absence of such an admission constitutes the risk communication variate. One-half of the questionnaires includes the following paragraph at the end of the advisory:

> NOTE: The numbers presented above are our best estimates. But it is important to realize that they are only estimates. They are based primarily on research with laboratory animals, usually rodents, who are given extremely high doses of the chemical being tested. If the animal exhibits health problems, we then extrapolate from these high doses to the very low doses usually

received by people who may be exposed to the chemical. The risk assessor chooses the assumption, or best guess, that appears least likely to underestimate the risks. An attempt is made to overestimate rather than underestimate risk. But it is an educated guess.

The risk communication is set in the context of a "Water Advisory Notice" put out by the EPA (See Appendix A). The advisory describes the chemicals causing the problem and the threats to health they pose. An "annual chance of death" comparison chart is presented which graphicallly compares the contaminated water risk with common risks such as smoking, hang gliding, scuba diving, skiing, driving a car, and drinking diet soda. Only voluntary risks were chosen because research indicates that forced comparisons between voluntary and involuntary risks are resented (Covello, et.al., 1987). Current conventional wisdom in risk communication indicates that:

*comparisons are useful in informing people about risks, and

*the comparisons should be those comparable to the focal risk in degree of voluntariness.

In other words, the risk format chosen here may generate some hostility because of the nature of the comparisons made. We will be able to assess that possibility in the comments solicited about the nature of the communication.

The Management Options

The literature on environmental conflict resolution points to two classes of options that can be offered a concerned community: incentive-compensation options and power-sharing options (Bord, 1987). Incentive-compensation options tend to be material rewards or payments designed to restore equity or to push the reward-cost ratio toward the reward end of the continuum. Power-sharing options are designed to provide local citizens and groups with some ability to have an impact on key decisions concerning site operation and monitoring. Each set of options has been suggested to moderate local concerns: one set appeals to pecuniary motives while the other appeals to control motives. One study suggests that the most vocal opposition to locally unwanted land uses, those who hold unqualified "NIMBY" (Not In My Backyard) attitudes, are more favorably predisposed toward power sharing options (Bord, 1985).

Three management options are systematically varied in this research: a "standard" scenerio, a participation in decision-making scenerio, and an indemnification scenerio (See Appendix A).

The "standard" scenerio includes the following:

*the formation of a concerned citizens' group when the site was added to the National Priorities List;

*the granting of a technical assistance grant to the local citizens group;

*the issuance of the remedial investigation and feasibility study;

*a public hearing organized by EPA; and

*commencement of the cleanup.

This option is characterized by a common cleanup scenerio in which EPA accepts comments as required by law, but makes cleanup decisions without directly involving local citizens in evaluating cleanup options.

The citizen participation option, which is actually an expanded "standard" option, includes the elements in the "standard" option with an important addition: EPA agrees to work with a citizen advisory committee which is given the right to review all EPA plans and to approve any proposed solution before it is put into effect. The final plan is described as a joint effort of the advisory committee and EPA experts.

The indemnification option also includes the elements noted in the "standard" scenario, but adds a section describing an indemnification program by the State. The State would, under a special experimental program, purchase the home of anyone within one mile of the site providing the owner had first tried to sell the property in the private marketplace and had been unable to get fair market value for it or could not sell it at all over a 12 month period.

The Dependent Variables

The purpose of this study is to examine the impact of variations in uncertainty communications and managment options on achieving consistency between objective and subjective risk estimates. We measure this consistently through four sets of dependent variables:

*the level of concern with living near the site, both before and after the cleanup;

*expectations of suffering health problems from living near the site, both before and after the cleanup;

*risk assessments of the danger of living near the site compared with other situations, both before and after the cleanup; and,

*behavioral intentions when faced with a Superfund site in the vicinity of one's home.

For the first three sets of variables, the achievement of consistency between each option and citizen attitudes is indexed, respectively, by low levels of concern, low expectations of health problems, and viewing living near the site as safer than smoking or driving a car. The fourth category, behavioral intentions, may serve as an indication of the intensity of concerns. Overreactions to the situation, such as leaving the area or buying bottled water, may indicate a failure to achieve consistency between objective and subjective assessments of the situation.

The Independent Variables

Variations in consistency between objective and subjective risk assessments, and other dependent variables, may be a function of variation in four sets of independent variables:

*risk uncertainty communications and management options, the quasi-experimental design of this study described above;

*attitudes citizens bring to a hazardous waste situation prior to any EPA invovlement;

*trust in government, science, and industry; and

*demographic factors such as education, age, gender, religiosity, and marital status, that predispose citizens to form attitudes consistent or inconsistent with expert opinion.

The first set of independent variables are the risk uncertainty communications and management options available to the Agency. Other factors, however, may account for significant variation in achieving consistency.

Attitudes citizens have prior to learning about the hypothetical Superfund situation may influence whether they develop risk assessments consistent with expert opinion. Before respondents read the material about the hypothetical case they answered questions that explored their levels of concern with toxic waste sites, beliefs that they personally may have health problems due to exposure to hazardous chemicals, estimates of health problems emanating from toxic waste sites, and their knowledge about toxic chemicals.

Regardless of how EPA communicates at a site or manages a cleanup, whether citizens reach consistency with expert opinion may be influenced by whether they trust the government, science, and industry. We therefore examine the levels of trust in government (local, state, and national), industry, and science - both whether scientists know enough to protect us and whether it is possible to control a problem like the one presented in this study.

Finally, demographic factors may stand as surrogates for life experiences that predispose people toward consistency or inconsistency with expert opinion. We examine whether differences in gender, age, income, education, marital status, and religiosity help in any way to explain variations in the dependent variables.

In accounting for variations in consistency with expert opinion, we look at these factors both individually (the bivariate measures in Section XI) and in multivariate analysis (Section XII). Before turning to a description of the results, a brief explanation of the sample and the data collection methods is necessary.

SECTION IV: SAMPLING AND SURVEY IMPLEMENTATION

Our concern is not with the degree to which the sample matches the population characterisitcs of the community. Instead, our concern is to ensure that adequate numbers of different types of people are included in the sample so that differences among these groupings can be explored. The sample design was deliberately stratified to include subsamples of the business community, members of local environmental organizations, elected officials, and civic activists. In addition, because of the desire to make the sample more comparable to a general population of American adults, far fewer undergraduate college students were included than would have been warrented if random sampling techniques were used in this area.

In this section we describe the location, the sample, how the interviewees were identified, and how the interviews were conducted.

The Centre Region

The "Centre Region" of Centre County is the official name of an area in the center of Pennsylvania. In 1980, the Bureau of the Census designated Centre County as the State College Metropolitan Statistical Area. The nucleus of this new MSA is the Centre Region which is composed of the Borough of State College and the Townships of College, Ferguson, Halfmoon, Harris, and Patton. These municipalities in 1980 had 66,000 of the 112,000 residents in the county. We chose to limit the sample to the Centre Region for three reasons:

> First, the Centre Region provides a substantial diversity of people. The area includes the main campus of the Pennsylvania State University, several advanced technology industries, traditional manufacturing industries in the glass and clay sector, a growing service sector particularly in hotels and recreation, and some farmers. There is diversity in demographics, but also an essential homoegeneity of exposure to situations regarding hazardous waste in the community. Differences in attitudes are likely to arise from factors measured by the questionnaire, not from experiences related to drastically different community events.
>
> Second, the Centre Region does have a hazardous waste site on the National Priorities List (Centre County Kepone), but that site has generated little publicity in recent years. However, there has been some recent, mild, concern generated by rumors of contaminated water in a nearby village and a fish kill caused by a malfunctioning sewage treatment facility. While these events form a backdrop for community concern, there has been no significant public outcry in any of these cases. In other words, Centre Region is probably similar to many other areas in the United States which have some history of toxic pollutants, some citizen concern, but no

significant social upheaval. Even during our interviews with members of environmental groups no one mentioned the local Superfund site or evidenced any major concern with the other local problems.

Third, areas of the county outside the Centre Region range from Amish settlements to mining towns. In the northwestern section of the county, approximately one hour away from the Centre Region, concern over toxic wastes allegedly dumped in abandoned strip mines received wide publicity during the period of interviewing for this study. Efforts to locate a solid waste facility in that area also generated heated debate. Interpretation of our data from areas outside the Centre Region would have been overly complicated by ongoing hazardous waste controversies in some communities. By restricting our focus to the Centre Region, we were better able to guarantee that the hypothetical case was the central stimulus for the respondent. While this enhances the study design, it limits the extent to which these results would be relevant in an area characterized by high levels of concern and controversy about hazardous waste.

Table IV-1: Sample and Population Demographics (in percentages)
N = 174

AGE	SAMPLE	POPULATION*
18-24	17%	56%
25-34	21	15
35-44	29	10
45-54	17	7
55-64	12	6
65+	4	6
	100%	100%
GENDER		
MALE	46%	52%
FEMALE	54	48
	100%	100%
MARITAL STATUS		
SINGLE	41%	66%
MARRIED	59	34
	100%	100%

*Source: State College Area School District
1985 Census

The Sample

Table IV-1 illustrates some of the differences between sample and population characteristics. The impact of students on the population parameters is obvious: 18 to 24 is the modal age group; there are more males than females (reflecting the sex ratio of the student body), and more people are single than married.

In selecting our sample, we deliberately chose long-term residents over students so as to produce a sample more closely approximating an average American community. The sample that emerged tends to over-represent highly educated people, homeowners, and, to some extent, wealthier residents. People with these characteristics tend to predominate in environmental debates and conflicts. However, in analysing the results we consistently examined the extent to which the demographic factors accounted for observed variance in consistency between objective and subjective risk assessments. The characteristics that differentiate our sample from the general population rarely account for significant differences. Table IV-2 demonstrates that the sample achieves substantial variation on all of the demographic characteristics.

In selecting the sample, particular attention was given to including civic activists, elected officials, environmentalists, and the business community. The sample has 31 civic activists, 19 elected officials, 23 environmentalists, and 22 members of the business community.

The civic activists are heavily involved in voluntary organizations such as the Lions Club. The intention was to select active organization members, not simply nominal joiners. To be identified as a civic activist, a respondent either is an officer in an organization or a member of two organization with regular attendance at meetings.

The elected officials are members of the borough council of State College, the county commissioners, the supervisors in the townships in the Centre Region, and the tax collectors in those townships with elected tax collectors. The county commissioner and the tax collector jobs are full-time. The council members and supervisors serve for a nominal or no fee since professional managers run the daily affairs in the municipalities.

The environmentalists are identified neither by their holding any particular attitudes nor by their membership in national organizations. Instead, the environmentalists are identified as members of local environmental groups such as the local chapter of the Sierra Club or Environmental Action. This operational definition was adopted in order to include only those with an active identification with environmental concerns within the community.

Finally, members of the business community are identified as individuals who work in the private sector in a managerial, professional, or administrative capacity. In this study they include, for example, chemists, small business owners, purchasing agents, and the owner of a winery.

Table IV-2: SAMPLE DEMOGRAPHICS (In Percentages)*

EDUCATION			
	HIGH SCHOOL	6%	
	TECHNICAL SCHOOL	5	
	SOME COLLEGE	26	
	COLLEGE GRADUATE	17	
	SOME GRADUATE WORK	13	
	GRADUATE DEGREE	34	
		100%	N = 174
FAMILY INCOME			
	UNDER $10,000	10%	
	$10 - 20,000	15	
	20 - 30,000	15	
	30 - 40,000	24	
	40 - 50,000	11	
	50 - 60,000	9	
	60 +	16	
		100%	N = 160; MD = 14
HOME OWNERSHIP			
	OWN HOME	55%	
	RENT	45	
		100%	
			N = 174
OCCUPATION			
	STUDENT	19%	(Undergrad and grad)
	PROFESSIONAL	14	(e.g., professor, lawyer)
	BUSINESS	14	(e.g., manager, sales)
	NOT IN LABOR FORCE	18	(e.g., retired, homemaker)
	SKILLED - TECHNICAL	17	(e.g., nurse, technician)
	LABORER	20	(e.g., clerical, factory)
		100%	N = 154; MD = 20
ATTEND RELIGIOUS SERVICES			
	NOT AT ALL	26%	
	SEVERAL TIMES YEARLY	22	
	MONTHLY	20	
	WEEKLY	25	
	MORE FREQUENTLY	7	
		100%	N = 171; MD = 3

*MD = Missing Data

These four categories are not mutually exclusive. In practice, no individual falls into all four categories, although a couple fit into three categories and several fit the criteria of two categories. For example, one person runs a property management firm, is active in several civic organizations, and is a borough councilman. These cross-cutting memberships reduce differences in attitudes and opinions among the four groupings. Although it would have been possible to compare group differences with multiple-member individuals excluded, there is no theoretically sound reason to do so. In all communities certain individuals perform multiple roles and have cross-cutting identifications. Three of the groupings, public officials, environmentalists, and civic activists, have in common a willingness to participate in voluntary, public activities in the community. The fourth group, members of the business community, have interests and resources that commonly lead to public involvement.

Identifying the Interviewees

Interviewees were initially identified through several means:

*elected officials received phone calls from the senior researcher on the project, Bob O'Connor;

*leaders of local environmental groups were contacted and asked if the principal investigators could address a meeting to ask for cooperation;

*instructors of Continuing Education courses, whose students are generally older, long-term residents, were asked to devote one class period to the survey in return for a discussion of social science and hazardous waste by the principal investigators;

*groups of university secretaries were asked to attend a lunch-hour session to complete the questionnaire and discuss the topic in return for gratitude and refreshments provided by the principal investigators; and,

*leaders of church groups were asked if the principal investigators could attend meetings either to seek volunteers or to conduct the survey and a discussion session.

These methods produced over 100 interviews. After reviewing the demographics of those interviewed, a research assistant went door-to-door in selected neighborhoods to conduct additional interviews. The neighborhoods chosen were those whose residents were under-represented among the interviews previously completed. We were particularly concerned in ensuring adequate numbers of interviews with those who are less well educated.

Of the elected officials called, the only one not interviewed was a supervisor who asked to respond by mail and who never returned the questionnaire. Three others were not in the State at the time of the research.

After completing 174 interviews in the Spring and Summer of 1988, we concluded that adequate numbers of interviews in all key groupings had been collected to permit the comparative analysis called for in the research design.

As noted in the first paragraph of this section, the sample is not designed to be representative of any particular population. There is, for instance, a strong overrepresentation of citizens who are active in community affairs; after all, elected officials comprise 11 percent of the sample but under one-tenth of one percent of the population of the Centre Region. The purpose of the research was not to explore the attitudes of a representative population but to examine the consistency between objective and subjective risk estimates among different types of people. The sample provides the means to achieve that objective.

Conducting the Interviews

Each interview was conducted in one of four ways:

- *orally and individually;
- *in writing in a group setting with a principal investigator present;
- *in writing and individually; or,
- *by mail.

When working individually with a respondent, we asked for the individual's preference between doing the survey in interview form or in writing. Most chose to write the responses, although a majority of the elected officials preferred the interview format. In the group sessions, we asked the respondents to fill out the questionnaires in writing before discussing reactions as a group. In some cases, particularly with elected officials and members of environmental groups, they mailed completed questionnaires to us. Of the individuals who requested questionnaires at environmental group meetings, only two failed to return them. A substantial majority of the questionnaires were filled out in group settings with one of the prinicpal investigators present, approximately 15 percent were filled out individually and mailed to us, approximately 10 percent were done in an individual interview session, and several were sent through the mail and returned to us.

Concern that the data collection format might influence the results proved unfounded. Testing for significance by analyzing all the crucial data by the type of data collection format failed to show any significant relationships. However, the small numbers in some of the formats suggest caution in assuming no differences.

Summary

The data are 174 completed interviews/questionnaires with residents of the Centre Region who were asked to react to a hypothetical hazardous waste site. Inferences made from the sample should be generalized to other populations with great caution. The sample overrepresents community elites. Instead, the data are intended to permit a more general examination of risk assessment issues in the context of a hazardous waste cleanup, among a sample of people not unlike those found highly involved in any important community issue.

SECTION V: PRIOR ATTITUDES, ISSUE INVOLVEMENT, AND INFORMATION

Douglas and Wildavsky (1982) argue that something akin to a culture of fear has developed in the United States with respect to many man-made technological and environmental risks. If that argument is valid then a large proportion of the population carries a predisposition to react strongly and negatively to the imposition of certain man-made risks. While it is true that not all communities react the same way to analagous risks, it may be that fear responses have taken on the characteristics of well-formed attitudes. Well-formed attitudes are easily triggered, usually simply structured, and invoke considerable levels of behavioral commitment. They are extremely difficult to change with ordinary information-education campaigns (for a discussion of this issue as it pertains to AIDS education, see Booth, 1988). Well-formed attitudes act as conceptual filters for incoming information and, to some extent, determine how that information is processed. This chapter examines the attitude-belief structure concerning toxic chemicals that people bring with them to a chemical waste situation. It explores the conceptual filter that exists prior to exposure to the hypothetical waste site, the respondent's level of both general and specific knowledge about toxic chemicals, and the source of their information about this issue.

General and Specific Levels of Concern

(See Appendix B for a Complete Copy of the Questionniare)

Two questions attempted to tap respondents' depth of concern about the toxic chemical issue. A general question was asked first and then a more specific question assessing level of concern by nine specific classes of health problems: adult cancers; childhood cancers; liver, kidney, and bladder problems; lung problems (not cancer); birth defects; miscarriages; leukemia; skin problems; and, "other serious childhood diseases." Table V-1 presents the results of the general question.

Table V-1: Level of Concern (in percentages): N=174.

VERY CONCERNED	54%
SOMEWHAT CONCERNED	43
NOT TOO CONCERNED	3
NOT CONCERNED AT ALL	0
	100%

A majority of these respondents report the highest level of concern and 97% express being somewhat or very concerned. The fact that virtually the entire sample expresses some level of concern gives credence to Douglas and Wildawsky's culture of fear thesis. However, a general expression of concern can mean many things. In an effort to ferret out some specifics respondents were asked their levels of concern for nine specific classes of health problems. Table V-2 presents their responses to each of those health problems.

Table V-2: Level of Concern for Specific Problems (in percentages): N=174.

Question: Here is a list of health problems that may be connected with exposure to chemicals. Would you indicate how concerned you are that you, or someone close to you, may suffer this problem because of exposure to chemicals in the air, soil, or water.

1 = Greatly Concerned
2 = Somewhat Concerned
3 = Not Too Concerned
4 = Not Concerned At All
5 = No Response

	(1)	(2)	(3)	(4)	(5)
ADULT CANCERS	57%	28%	8%	7%	0%
CHILDHOOD CANCERS	57	24	10	8	1
LIVER, KIDNEY, & BLADDER PROBLEMS	40	38	16	5	1
LUNG PROBLEMS (Not Cancer)	44	34	15	6	1
BIRTH DEFECTS	61	20	10	8	1
MISCARRIAGES	50	27	13	9	1
LEUKEMIA	49	32	9	8	2
SKIN PROBLEMS	39	34	22	5	0
OTHER SERIOUS CHILDHOOD DISEASES	48	28	14	8	2

Cancers and birth defects predictably generate the highest levels of concern. What is noteworthy about Table V-2, however, is the small variation in concern expressed across all classes of health problems. Seventy-three percent of the sample expresses some level of conern even for skin problems, which presumably are not life threatening. These results reinforce the assumption that fear of man-made toxins may exhibit characteristics of well-formed attitudes and beliefs. Only 7 to 10 percent of this sample consistently expresses little or no concern that chemicals may cause health problems for the respondent or someone close to them.

Levels of concern illustrate one dimension of people's fears, that is, most of these respondents believe that they or someone close to them may experience health problems as a result of exposure to toxic chemicals. What this measure does not tell us is how probable they think that health risk is. Table V-3 presents the results of a question designed to assess public beliefs about how many new cases of a specific class of health problems are a result of exposure to toxic chemicals. In other words, this question attempts to determine the extent to which people view toxic chemicals as a primary cause of certain classes of health problems. While there may not be good scientific answers to these questions, which makes it difficult to use these answers as benchmarks of the accuracy of public judgments, they can serve as a sort of Rorschach test of public fears. In other words, when people interpret somewhat ambiguous stimuli their predispositions and decision biases become apparent.

Table V-3: Estimates of How Many New Cases Per 100 of Nine Different Health Problems are Caused by Toxic Chemicals from Waste Sites (in percentages): N=174.*

	Zero Cases	One Case	2-5 Cases	6-10 Cases	11-25 Cases	26-49 Cases	50+ Cases
ADULT CANCERS	1%	11%	29%	19%	16%	10%	9%
CHILDHOOD CANCERS	1	12	28	17	18	8	11
LIVER, KIDNEY, BLADDER PROB.	3	10	35	14	17	8	7
LUNG PROBLEMS (Not Cancer)	8	14	22	18	15	6	9
BIRTH DEFECTS	3	12	28	17	18	10	6
MISCARRIAGES	5	14	27	18	14	9	7
LEUKEMIA	6	14	33	10	12	12	6
SKIN PROBLEMS	5	14	20	17	19	10	8
OTHER SERIOUS CHILDHOOD DISEASES	5	13	31	17	14	5	7

*The percentage remaining in each case reflects the fact that a few respondents chose not to answer these questions.

The results in Table V-3 dramatically illustrate the beliefs underlying many people's fears of toxic chemicals. Almost one in five respondents believe that 26 percent or more of adult cancers, childhood cancers, leukemia, and skin problems are caused by "toxic chemicals from waste sites." At least one in three respondents believe that 11 percent or more of these diseases are caused by toxic chemicals from waste sites.

In addition to the above respondents were also asked the following open-ended question:

> Are there any health problem we haven't mentioned that you think may be strongly related to toxic chemicals in the environment?

Nine percent of the respondents indicated various neurological problems while 8 percent named "mental health problems." In addition, 2 percent mentioned Parkinsons Disease. There appears to be a significant portion of the population who holds toxic chemicals accountable for some of our most dreaded neurological problems.

The scope and depth of people's beliefs about the implication of man-made toxins in some of modern society's most dreaded health problems bode ill for those attempting to construct objective risk communication. What data, and what sort of message construction or delivery, could allay the fears of those who believe that 50 percent or more of adult cancers are caused by toxic chemicals from waste sites? Furthermore, it is reasonable to assume that those who hold these beliefs are the ones who would be most vociferous in protesting an agency's handling of a toxic waste problems. This possibility will be explored in later chapters.

Finally, a question was designed to determine to what degree people felt that their own health had been affected by exposure to toxic chemicals. Table V-4 presents the percentage distribution for that question.

Table V-4: Estimates of Having Suffered Health Problems (in percentages): N=174.

Question: Do you think that you have suffered health problems due to exposure to hazardous chemicals in the water, soil, or air?

YES, DEFINITELY	6%
I SUSPECT I HAVE	21
I DOUBT THAT I HAVE	61
NO, I DEFINITELY HAVE NOT	12
	100

The results of this table parallel the results noted in Table V-3. More than one in four respondents feels that he or she has suffered health problems as a result of toxic chemicals.

The extent to which a significant portion of this sample is willing to attribute cause for numerous health problems to man-made toxins is instructive. This pattern of results indicates that, for a many people, man-made toxins are a major evil in modern society. This supports the notion of a culture of fear and the idea that fear of man-made toxins is, at least for a portion of this sample, a well-formed attitude.

While we know of no study that attempts to estimate the number of cancers, or other health problems, caused by toxic waste sites, there are two reasons to believe that these respondents are overestimating the implication of toxic chemicals from waste sites in the etiology of cancers and other health problems: it is highly unlikely that toxic chemicals are causal factors in most or all cancers; and, man-made toxins cause fewer cancers than natural toxins found in peanuts and other common foods (Travis, et.al., 1987).

In attempting to determine who is more concerned, two demographic characteristics demonstrate somewhat consistent patterns of correlation: gender and education. In general, women are somewhat more concerned than men and overestimate more than men the number of diseases caused by chemicals in the environment. However, the most instructive correlations are those of education with the level of concern and with estimates of various diseases caused by man-made chemicals in the environment. Table V-5 presents these correlations.

Table V-5: Pearson Correlations Between Levels of Education and Concern and Incidents of Various Health Problems.

Health Problems	Level of Concern	New Cases Per 100
ADULT CANCERS	N.S.	r = -.32***
CHILDHOOD CANCERS	N.S.	r = -.32***
LIVER, KIDNEY, BLADDER	N.S.	r = -.26***
LUNG	N.S.	r = -.20**
BIRTH DEFECTS	N.S.	r = -.26***
MISCARRIAGES	N.S.	r = -.24***
LEUKEMIA	N.S.	r = -.20**
SKIN PROBLEMS	r = .15*	r = -.31***
CHILDHOOD DISEASES	r = .19**	r = -.28***

*P=.02
**P=.01
***P=.001
N.S.= NOT SIGNIFICANT

The above table dramatically illustrates that accuracy of the respondents' risk estimates is strongly affected by levels of education while the concern levels are less affected. For every health problem, levels of education decrease the risk estimates for each of the problems that we examined.

The finding that the better educated are somewhat more likely to express a high level of concern with skin problems and childhood diseases and much less likely to overestimate the proportion of new cases arising from waste sites may seem anomalous at first glance. With further reflection, there is no inconsistency here because one's level of concern may represent a summary judgment involving the likelihood of problems emanating from chemicals in general. The second measure, cases per 100 resulting from waste sites specifically, asks for a judgment of comparative causes. The better educated are not more concerned than the less well educated, but the former are much less likely to attribute health problems to waste sites specifically.

Prior Knowledge and Issue Involvement

Prior knowledge was measured in a number of ways. Table V-6 presents

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Table V-6: Self Estimates of How Well Informed Respondents are on the Toxic Waste Issue (in percentages): N=174.

Question: When it comes to the issue of toxic chemicals do you consider yourself:

WELL INFORMED	03%
SOMEWHAT INFORMED	50%
NOT VERY INFORMED	43%
NOT INFORMED AT ALL	04%
	100%

Table V-7: Levels of Specific Knowledge.

Question: Have you heard of the chemical benzene?

YES	75%
NO	25%

Question: Is benzene a health hazard?

YES	54%
NO	46%

Question: Have you heard of the chemical trichloroethylene or TCE?

YES	53%
NO	47%

Question: Is trichloroethylene a health hazard?

YES	39%
NO	61%

the results of a general question about level of information. While a majority of these respondents view themselves as somewhat or well informed it is clear that the vast majority view themselves as marginally informed on this issue.

More specific assessments of knowledge tapped respondents' knowledge about benzene and trichloroethylene, the two chemicals included in the hypothetical site description. Table V-7 presents the results of the analysis. These results are not surprising. Benzene is a somewhat common chemical and enjoys wide name recognition. Besides the above, respondents were asked open-ended questions about the source or use of these two chemicals and the specific health threat they posed. Approximately 15 percent of the sample accurately identified the source(s) of benzene while less than 10 percent so identified the source(s) of trichloroethylene. Similarly, while 22 percent labeled benzene as a carcinogen only 12 percent so labeled trichloroethylene.

The correlates of information accuracy are predictable: the more highly educated, males, and somewhat older people know more about these chemicals. These items are later used in a knowledge scale and related to various dependent variables.

When asked the source of their knowledge 16 percent say they have not read or heard much about his subject. The remaining 84 percent get their information from, respectively: television, newspapers, magazines, and radio. Television news programs and documentaries such as 60 Minutes or 20/20 are disproportionately picked as sources as are Newsweek and Time Magazines and local newspapers. Prestige and educational sources of information, such as the New York Times, Harpers, professional journals, and educational television, are severely underchosen.

To assess respondents' levels of involvement in the toxic waste issue they were asked how aware they were of toxic waste problems in their immediate area, the state, the nation, and in media coverage. They were also asked specifics about awareness and their level of actual involvement. The following summarizes the results of those questions:

*approximately 50 percent of the sample reports awareness of local, state, and national toxic waste problems and can provide specific examples.;

*only 20 percent contend that they are personally involved in this issue locally;

*involvement tends to mean attending meetings, writing letters to officials, being members or officials of concerned organizations, or consultants; and,

*Love Canal tends to be the example most often recalled.

*In general, females, the more highly educated, the married, home owners, and those with children are more aware and more involved.

These items are also scaled and used in subsequent analysis.

Summary of Section V

The following is a summary of the more important results:

*the levels of concern, measured by any standard, are high;

*while levels of knowledge are strongly related to respondents health risk estimates - those with more education make more plausible estimates - they are less related to levels of concern;

*cancer and birth defects trigger the most fear;

*there is a tendency to overestimate man-made toxins as causes of multiple health problems;

*one-quarter of this sample thinks that their own health has been negatively affected by toxic chemicals;

*people are probably not generally well-informed about man-made toxins;

*T.V. news is the major source of information about toxic chemicals;

*over one-half of the sample is aware of specific toxic waste problems in their area, the state, and the nation;

*approximately 20 percent report actual involvement in this issue; and,

*those who are more integrated into the community tend to more involved in the toxic waste issue.

SECTION VI: TRUST

In the attitude change literature, communicator credibility has been equated with expertise and trustworthiness (Aronson, et.al., 1963; McGuire, 1969;). Of these dimensions trustworthiness must certainly rank as the most crucial. All of the other factors depend on trustworthiness for their effectiveness. Expertise cannot be credible without a belief in the knowledge base of the expert and faith that the expert is acting with integrity. Attractiveness can actually be a detriment to effective communication if the audience thinks that the communicator is using his or her attractiveness in a dishonest or manipulative manner. If communicators are distrusted, nothing they can say will bring about greater consistency between objective and subjective risks. Besides involving assessments of the honesty and integrity of insitutions, an individual's trust calculus may include judgments of the ability of scientists and engineers to control problems such as the one presented in this study. Before assessing levels of concern and the relative accuracy of risk assessment it is essential to describe the environment of trust in which the communications took place. The focus is on a multidimensional view of trust, including how citizens evaluate whether scientists know enough to protect us from harmful chemicals. Within this broad context of trust several dimensions are explored:

*the perceived honesty of federal, state, and local government;

*the degree to which industries that use toxic wastes, and the governments that regulate those industries, are seriously interested in protecting public health; and

*the ability of scientists and others involved in toxic waste managment to adequately protect public health.

First, before the trust findings, we report the responses to a question that asks if the United States is safer today than it was 30 years ago regarding environmental pollution. These data are presented here in part to provide a context for interpreting the trust question responses.

As noted in Table VI-1, two-thirds of the sample believe that the country is less safe today than it was 30 years ago. Despite the rise of the environmental movement, the formation of the U.S. Environmental Protection Agency, the passage of landmark Federal acts, and a substantial increase in efforts to control environmental pollution by state and local governments, few respondents judge the situation as safer in terms of environmental pollution. This finding is consistent with other research and speculation and suggests that risk communications are likely to occur in a context of widespread apprehension.

Majorities of the environmentalists, civic activists, business leaders, and the general sample judge the United States to be environmentally less safe now than 30 years ago. Elected officials are unique in holding a majority (58 percent) who find existing environmental conditions safer than those of the late 1950's.

Table VI-1: Responses to the Question, "From the standpoint of environmental pollution, is the United States today more or less safe than it was 30 years ago? (N = 173; MD = 1)*

MUCH SAFER	6%
SOMEWHAT SAFER	20
ABOUT THE SAME	8
SOMEWHAT LESS SAFE	32
MUCH LESS SAFE	35
	100%

*MD=Missing Data

More directly related to questions of risk communications are questions that ask if officials can be trusted to tell the truth in situations involving toxic waste problems. Table VI-2 reports that, although few citizens are totally trusting of government officils, most respondents find officials at least somewhat trustworthy.

Table VI-2: Responses to the Questions, "In your estimation, how much can you trust local officials, State officials (such as the Department of Environmental Resources), Federal officials (such as the Environmental Protection Agency) to give you the truth in situations like this?

	Local	State	Federal
YOU CANNOT TRUST THEM AT ALL	11%	8%	11%
YOU CANNOT TRUST THEM VERY MUCH	33	28	28
YOU CAN TRUST THEM SOMEWHAT	48	56	51
YOU CAN TRUST THEM A LOT	8	7	11
	100%	100%	100%
	N=172 MD= 2	N=172 MD= 2	N=172 MD= 2

Although these figures are not a resounding expression of confidence that public officials can be trusted to provide the truth in a Superfund situation, neither do they report a view of public officials as entirely dissembling. For each level of government, more respondents are on the "can trust" side than on the "cannot trust" side. Although the people may be skeptical of official pronouncements, few find public officials totally untrustworthy.

Perhaps surprising in these data is the lack of greater trust for local officials, especially in light of the fact that 11 percent of the sample is composed of elected officials themselves. The municipalities of the Centre Region have reform-style governments with professional managers, little patronage, and no scandals within recent memory. However, this relative lack of trust in local officials is consistent with research on other environmental risks such as low-level radioactive waste (Bord, 1985).

Table VI-3 breaks down the trust-for-local-officials for different segments of the community. Not surprisingly, local officials are quite trusting of themselves. Still, the overall sample divides evenly between the "can trust" and "cannot trust" sides. Only among members of local environmental groups and among the less-well-educated respondents do distrusters substantially outnumber respondents who trust local officials somewhat or a lot. Of course, the relatively small size of each group indicates caution in interpreting these results. The results, however, are consistent with research on other environmental hazards (Bord, 1987).

Table VI-3: Responses to the Question, "In your estimation, how much can you trust local officials to give you the truth in situations like this?

	ENVNT	ELECT	CIVIC	BUSNS	LOW ED	GRADS
NOT AT ALL	22%	0%	19%	14%	15%	10%
NOT VERY MUCH	39	5	16	14	41	31
SOMEWHAT	39	47	42	50	39	48
A LOT	0	47	23	23	4	12
	100%	100%	100%	100%	100%	100%
N=	23	19	31	22	46	59
MD=	0	0	0	0	1	0

In the interviews several respondents explained their reasons for their relative low rating of local officials. They said that local officials would be reluctant to provide the full truth because of two concerns: that citizens might respond with unreasonable demands and that the reputation of the community as a safe, good place to live might be harmed. State or Federal officials might be less sensitive to protecting the reputation of the community, and therefore, more forthcoming with honest information.

Another way to examine honesty is to put it in the context of whether institutions are more honest today than they were in the past. Table VI-4 illustrates that most respondents believe that State and Federal agencies with responsibilities in the environmental arena are at least as honest today as they were 30 years ago. The fact that in 1988 the executive branches of government were headed by a Republican in Washington and a Democrat in Harrisburg seems to indicate that the perceptions of honesty are not tied to affection for either political party. On the other hand, perhaps Americans are generally cyncical and simply believe that government has never demonstrated high levels of integrity. We did not tap that possibility.

There is some skepticism toward officials, yet few respondents say they cannot trust officials at all and few perceive that agencies have become less honest.

Table VI-4: Responses to the Question, "Are Federal govt. agencies, such as the EPA, (State govt. agencies, such as the Department of Environmental Resources) more or less honest today than similar government agencies 30 years ago?

	EPA	DER
MUCH MORE HONEST	5%	7%
SOMEWHAT MORE HONEST	30	28
ABOUT THE SAME	42	47
SOMEWHAT LESS HONEST	18	15
MUCH LESS HONEST	5	4
	100%	100%
N=	171	170
MD=	3	4

Similarly, few respondents report that either the industries that manage toxic chemicals or government agencies that regulate those chemicals have no interest at all in protecting public health. On the other hand, only one-quarter of respondents report that protecting public health is the "major concern" of the regulatory agencies. These results are steady among civic activists, the business community, and both those with graduate degrees and those without a college diploma. The noticeable differences are among the elected officials, who are quite impressed with the public health concerns of both industry and the regulatory agencies. Also different are the environmentalists who, not surprisingly, are generally less trusting. Table VI-5 presents the results for the entire sample, the environmentalists, and the elected officials. Although members of local environmental groups are decidedly less convinced that government regulatory agencies are strongly committed to protecting public health, none of them in the sample argues that the regulatory agencies have no interest at all in protecting public health. Only 13 percent credit the government with "little interest." On this and other measures the environmentalists are somewhat different from other groups, but the differences are not stark.

Table VI-5: Responses to the Questions, "Do you think that industries which use toxic chemicals (the govt. agencies which are supposed to regulate the chemical industry) are seriously interested in protecting public health?

YES, IT IS ONE OF THEIR PRIMARY CONCERNS
THEY HAVE SOME INTEREST IN IT
THEY HAVE LITTLE INTEREST IN IT
THEY HAVE NO INTEREST IN IT

	OVERALL		ENVIRONMTLTS.		ELECTED OFFS.	
	INDSTY	GOVT	INDSTY	GOVT	INDSTY	GOVT
YES	6%	26%	4%	13%	22%	42%
SOME INT.	57	64	44	74	72	58
LITTLE INT.	31	9	44	13	6	0
NO INTEREST	6	1	9	0	0	0
	100%	100%	100%	100%	100%	100%
N =	173	174	23	23	19	19
MD =	1	0	0	0	0	0

Trust in environmental issues involves an assessment of the capabilities of scientists and science itself as well as views about the honesty and integrity of institutions. A person may believe that officials are honest and committed to doing the best they can, yet still have little confidence because of a belief that basic scientific and technical knowledge is lacking. Table VI-6 indicates that there is considerable doubt both that scientists know enough about the impact of chemicals to adequately protect public health and that it is possible to manage a Superfund site so that there is little or no health threat to the community. Only one in six respondents checked that scientists definitely know enough and that it is definitely possible to control the problem at a Superfund site so that there is little or no health threat. On the other hand, only one in six checked that scientists definitely do not know enough and an even smaller number are equally certain that it is impossible to control the problem at the waste site. Most respondents are unsure about what scientists know and about whether it is possible to adequately address health problems emanating from a Superfund site. This suggests that many citizens will greet any communications involving health and safety assurances, in the context of toxic waste management, with a good bit of skepticism.

Table VI-6: Responses to two Questions.

Question 1: In your estimation, do scientists know enough about the impact of chemicals on our health to adequately protect us?

YES, THEY DEFINITELY KNOW ENOUGH	15%
I HAVE SOME DOUBT THAT THEY KNOW ENOUGH	47
I HAVE SERIOUS DOUBTS THAT THEY KNOW ENOUGH	23
NO, THEY DEFINITELY DO NOT KNOW ENOUGH	15
	100%
N =	173
MD =	1

Question 2: Do you think it is really possible to control a problem like this so that it presents little or no health threat to the community?

YES, DEFINITELY	17%
PROBABLY, AT LEAST I THINK SO	47
PROBABLY NOT	30
NO, DEFINITELY NOT	7
	100%
N =	173
MD =	1

In decomposing these results for the different groups, elected officials stand out in their belief in the possibility of managing the site without threatening the health of the community. Ninety percent find that the cleanup probably or definitely can be done without threat to health. This belief does not flow from great trust in science; elected officials actually fall below the mean on the question of scientists knowing enough to protect public health. What may be happening is that their belief that the problem can be controlled may reflect their trust in State and Federal officials to give them the truth. We reported earlier that, not surprisingly, elected officials are much more trusting of local officials than are other citizens. In fact, the elected officials are much more trusting of both State and Federal administrators than is the general public. No elected official checked "you cannot thrust them at all" and only one in four checked "you cannot trust them very much." As one respondent stated, "I've had a lot of dealings with DER — less so with EPA — but both have been forthcoming when we've needed information. They've never given me any reason not to believe them when they say they can do something."

Differences among the other five groupings are not great. Not surprisingly, environmentalists are the most skeptical segment regarding both the knowledge scientists have of the health effects from exposures to chemicals and the possibility of cleaning up a Superfund site without threatening the community's health. Fifty-seven percent of environmentalists either seriously doubt that scientists know enough or definitely know that scientists lack adequate knowledge. Only forty-eight percent believe that the cleanup either definitely or probably can be done without a health threat. Although the environmentalists are somewhat more skeptical and the differences between them and everyone else are statistically significant at the .05 level, these differences should not be overemphasized. After all, the environmentalists are almost evenly divided among themselves on these questions. The difference is that they are almost evenly divided, while two-thirds of the other respondents have a positive reaction to what is known and what is possible.

The different dimensions of trust are clarified when Guttman scaling procedures are applied to the trust variables. The Guttman scaling technique (Guttman, 1944) is used to determine whether a series of attitude questions tap the same underlying dimension. If the items reflect the same attitudinal dimension they will produce a scale that is both unidimensional (assessing the same dimension) and cumulative (respondents who reply positively to a difficult item will reply positively to less difficult items). Actually a variant of factor analysis, Guttman scaling allows an assessment of the number of dimensions involved in respondent treatment of a concept. As used in this report, every scale realizes the Guttman criteria of a Coefficient of Reproducibility of at least 0.90 and a Coefficient of Scalability of at least 0.60.

When Guttman scaling is applied to the trust items discussed in this section, four separate measures emerge: two scales and two single variables. One two-variable scale combines trusting local officials to tell the truth and believing that industry is seriously interested in protecting public health. This means that the individuals who are most trusting of local officials are also most trusting of industry. They are not necessarily the same people are most trusting of State and Federal agencies.

A second scale includes six variables:

*trusting DER to tell the truth;

*trusting EPA to tell the truth;

*judging federal agencies to be more honest now than they were 30 years ago;

*judging state agencies to be more honest now than they were 30 years ago;

*judging the country safer now than 30 years ago from the standpoint of environmental pollution; and *believing that State and Federal agencies are seriously interested in protecting public health.

The fact that these items form a scale is not surprising; they all seem to have a common element of support for State and Federal agencies.

Two other items used in this section -- believing that scientists know enough to protect us from chemicals and thinking that it is possible to control a problem like the hypothetical case in this study so that there is little or no health threat -- do not form a scale either with each other or with other scales. This suggests that this research taps four dimensions of trust:

*trust in Federal and State agencies;

*trust in local officials and industry;

*belief that science knows enough to protect us; and,

*trust that it is possible to deal with a hazardous waste contamination problem so that the community's health is not threatened.

The fact that trust in local officials scales with trust in industry, not with trust in EPA or DER, suggests that citizens view local officials as closer to industry than to environmental agencies. Efforts by local officials to increase the consistency between objective and subjective risk estimates may fail if citizens view local officials as representing industry positions. In addition, efforts by EPA to win the support of concerned local citizens may be undermined if the Agency is viewed as listening only, or primarily, to local officials.

Also noteworthy in the four dimensions is the lack of an underlying common dimension between trusting science and believing that it is possible to manage the situation without threatening the community's health. Individuals may believe that scientists know enough to protect us, yet doubt the ability of government agencies to effectively manage a Superfund site.

The purpose of this section has been to present an overview of the levels of trust in the community toward relevant institutions. Before advancing to the next section, however, we want briefly to outline the demographic correlates of trust. For most of the measures we find that there are some demographic correlates, but the strength of the relationships leave most of the variance to be explained by other factors. Table VI-7 summarizes the findings that are consistent with those of other researchers. Trust seems to increase with age and attendance at religious services, and is greater for males. Married people and those with graduate degrees seem to be more trusting except on the question of whether scientists know enough about chemicals to protect us. On that question, single individuals and the less-well educated are more positive. Home ownership is positively related to trusting Federal officials but negatively related to a high opinion of what scientists know.

Table VI-7: Correlations of Trust Measures with Demographic Variables. (The coefficients are tau's, an ordinal analog to Pearson's r).

	Male	Age	Relig.	Marital	Home	Incm	Educ
SAFER NOW	.16**						
TRUST LOCALS	.14*	.15**	.18**	.13*		.18**	.14*
TRUST STATE							.15*
TRUST FEDS					.12*		
STATE MORE HONEST NOW	.17**	.15**		.13*			
FEDS MORE HONEST NOW	.14*						
INDUSTRY CARES	.13*	.12*	.11*				
GOVT. CARES	.19**						
SCIENTISTS KNOW		.13*	.14*	-.18*	-.21**		-.16**
POSSIBLE TO MANAGE SAFELY		.11*		.12*			.11*

* = significant at .05
** = significant at .01

While five of the trust questions exhibit only one statistically significant correlation with any of the demographic variables, trust in local officials correlates with all except home ownership.

In conclusion, the citizenry appears skeptical with neither trusted heroes nor clear villans:

*a large majority believes that the country is less safe environmentally than it was 30 years ago;

*most people respond that they can trust government officials at least somewhat, with cynicism greatest toward local officials, and support weakest among environmentalists, and strongest among elected officials themselves;

*few citizens judge State and Federal agencies to be less honest today than they were 30 years ago;

*most respondents believe that industry and government have at least some interest in protecting public health;

*most people have some doubts that scientists know enough to protect us from the impact of chemicals, and over one-third believe that it is definitely or probably not possible to control toxic wastes at a Superfund site so that it presents little or no health threat to the community;

*trust does not form a single scale but four dimensions of trust in local officials, State and Federal agencies, science, and the ability to manage a Superfund site safely;

*statistically significant demographic correlates with opinions are frequent, but do not account for most of the variance in trust.

Having outlined a skeptical community, we turn in the next section to describing their levels of concern with living near a hypothetical Superfund site.

SECTION VII: THE HYPOTHETICAL SITE - LEVELS OF CONCERN

The first question asked after respondents read about the hypothetical Superfund site was, "How concerned would you be about living within one mile of this site prior to the cleanup attempt?" Over three-quarters of the sample checked the "extremely concerned" option. Not a single person said that he or she would "not be concerned at all." The next question asked for the level of concern after the cleanup had been completed. As Table VII-1 shows, almost half the sample reported that they still would be extremely concerned about living near the site.

Table VII-1: Responses to the Question, "How concerned would you be about living within one mile of this site prior to the cleanup attempt (and, after the EPA had completed the proposed cleanup)?

	Prior	After
EXTREMELY CONCERNED	78%	44%
SOMEWHAT CONCERNED	19	46
NOT TOO CONCERNED	3	9
NOT CONCERNED AT ALL	0	2
	100%	100%
N =	174	174

More respondents retained the same level of concern than reported less concern resulting from the cleanup. However, almost 40 percent of the respondents did indicate that the cleanup would reduce their level of concern. The results fall into five categories:

*forty-four percent remained extremely concerned;

*thirteen percent remained somewhat concerned;

*three percent were not too concerned from the start;

*thirty-four percent initially were extremely concerned but became less concerned after the cleanup; and

*six percent were only somewhat concerned before the cleanup and were even less concerned after its completion.

As noted in the previous section with the analysis of trust, members of environmental groups and elected officials were found to be somewhat distinct. Also, the trust factors frequently correlated with common demographic variables. Regarding levels of concern, however, the only group that stands out is the lesser educated. They are substantially more concerned about living near the site after the cleanup than members of the other groupings. Environmentalists show no greater concern with living near the site than the rest of the sample. Table VII-2 reports the results for the groupings after the cleanup. The before-cleanup table for the various groups is not presented because there is almost no between-group variance due to the general consensus that living near such a site warrants extreme concern.

Table VII-2: Responses of the Groups to the Question, "How concerned would you be about living within one mile of this site after EPA had completed the proposed cleanup?"

	ENVMT	ELECT	CIVIC	BUSNS	LOW ED	GRADS
EXTREMELY	35%	42%	39%	32%	57%	35%
SOMEWHAT	52	47	47	50	43	50
NOT TOO	13	11	13	18	0	14
NOT AT ALL	0	0	1	0	0	1
	100	100	100	100	100	100
N =	23	19	31	22	47	59

Application of the Guttman scaling technique to concern with living near the site both before and after the cleanup produces a single scale measuring this concern. Later in this report that particular measure will be used in accounting for risk estimates through multivariate techniques.

The only demographic variable that correlates with level of concern with living near the site before cleanup is age. The relationship between level of concern and age is slightly negative (tau = -0.12; sig. at .05) as fewer older respondents express extreme concern. After the cleanup, only gender and education correlate with concern. Females (tau = 0.20; sig. at .01) and the less-well educated (tau = -0.17; sig. at .01) are more concerned than other citizens.

The initial analysis of levels of concern produces three basic findings:

*there is a broad consensus of great concern before the cleanup;

*almost half the sample remains extremely concerned after the cleanup; and

*among the six groupings and the demographic variables, only education and gender account at all for differences in concern.

These results suggest that respondents did take the hypothetical situation seriously enough for most to report that they would be extremely concerned. The virtual absence of correlations with demographic variables suggests that other factors, including the risk communication manipulations, may account for the results. We return to explore this question in section XI after covering the health risk perceptions, comparative risk assessments, and behavioral intentions in the next three sections.

SECTION VIII: THE HYPOTHETICAL SITE - HEALTH RISK ASSESSMENTS

After reading the information about the hypothetical Superfund site, respondents immediately recorded their levels of concern and their assessments of the probabilities that they or/and their families would suffer health problems as a result of living near the site both before and after the cleanup.

Table VIII-1: Responses to the Questions, "How probable do you think it is that you (your family members) would suffer health problems as a result of living near this site prior to the cleanup (after EPA had completed the proposed cleanup)?

	You Prior	You After	Family Prior	Family After
EXTREMELY	40%	14%	44%	16%
SOMEWHAT	46	55	46	54
NOT TOO	14	28	10	26
NOT AT ALL	0	4	0	5
	100	100	100	100
N =	174	174	174	174

Completion of the cleanup has a significant impact on reducing assessments that health problems would result from living near the site. Forty-one percent of the sample reduced their assessments that they would suffer health problems, and 44 percent reduced their assessments that their families would suffer. Most of this improvement comes from people moving from the "extremely probable" response instead of from the "somewhat probable" response to a lower probability. If the "extremely probable" response is viewed as respresenting a dread factor, completing the cleanup reduces that factor from almost half of the sample to, at most, one of six persons. While an impressive improvement, these changes do not connote consistency between objective and subjective risk assessments. Scientists would evaluate the probability of health effects from living near the site after the cleanup as "not probable at all," and certainly not higher than "not too probable." Two-thirds of the sample disagree, placing the probabilities higher.

Table VIII-2 presents results from the six sub-samples of Centre Region citizens regarding the individual's assessment of the probability that he or she would suffer health problems. Because results from the assessment for the family are similar, we report only the results for the respondent's own health.

Table VIII-2: Responses to the Questions, "How probable do you think it is that you would suffer health problems as a result of living near this site prior to the cleanup attempt (after EPA had completed the cleanup)?

Prior to the Cleanup

	Envmt	Elect	Civic	Busns	Low Ed	Grads
EXTREMELY	22%	37%	39%	18%	62%	27%
SOMEWHAT	65	42	52	55	36	51
NOT TOO	13	21	10	27	2	21
NOT AT ALL	0	0	0	0	0	0
	100%	100%	100%	100%	100%	100%
N =	23	19	31	22	47	59

After the Cleanup

	Envmt	Elect	Civic	Busns	Low Ed	Grads
EXTREMELY	17%	5%	16%	5%	26%	10%
SOMEWHAT	48	58	58	41	64	46
NOT TOO	30	37	19	50	10	39
NOT AT ALL	4	0	7	5	0	5
	100%	100%	100%	100%	100%	100%
N =	23	19	31	22	47	59

Environmental group members, who can be assumed to be better informed than the average citizen, are somewhat below the average on the dread factor, the "extremely probable" response, before the cleanup. After the cleanup, they closely resemble the sample as a whole. Although they overestimate the risk of health problems, they are not alarmist in comparison with the general population.

The group whose subjective assessments are most consistent with expert opinion is the business community. One-quarter of these private sector managers, administrators, and owners thought that the chances of health problems were "not too probable" before the cleanup. After the cleanup, over half reached this conclusion.

In sharp contrast with the business community is the less educated group of citizens. Although 36 percent of the sample of less educated people lowered their assessment of the probability of health problems with completion of the cleanup, these probability assessments of the situation after the cleanup are higher than the probability assessments of both the business community and the highly educated for the situation before the cleanup. After the cleanup, 90 percent of the less educated reported that health problems would be "extremely" or "somewhat" probable.

The four health risk estimates (that you and your family would suffer health problems before and after the cleanup) form a single Guttman scale. This constitues a single measure of the consistency between expert and popular opinion; the higher the scale score, the greater the estimated likelihood of sickness, and the greater the gap between popular and expert opinion. This scale will be part of the multivariate analysis of section XII.

Health risk assessments do not correlate at all with any common demographic variables with two robust exceptions: education and gender. The first finding is not surprising in light of the findings reported in Table VIII-2. High health risk assessments consistently decreases with more education (tau = -0.26; sig. at .0001 for prior to cleanup; tau = -0.24; sig. at .0001 for after the cleanup). The second finding is that the women in the sample were much more likely to assess their probabilities of health problems as likely (tau = 0.31; significant at .0001 for prior; tau = 0.32; sig. at .0001 for after). Fifty three percent of the women checked "extremely probable" for health problems before the cleanup; only 24 percent of the men did likewise.

Before examining the impact of variations of risk communications in Section XI, we can make some conclusions regarding health risk assessments:

*over one-third of the entire sample, and almost two-thirds of the less educated, report an extreme probability that health problems would result from living near the site before the cleanup;

*with completion of the cleanup, half the sample either reduced their health risk assessments or were not too concerned even before the cleanup;

*environmental group members make similar assessments to those of the rest of the population;

*the business community has the lowest health problem estimates, so it is closest to matching expert opinions; and

*women and the less educated are substantially more likely to overestimate the probability of health problems.

SECTION IX: THE HYPOTHETICAL SITE - COMPARATIVE RISK ASSESSMENTS

Besides asking respondents if they would have health problems from living near the site, we also asked them to compare the threat to a person's health and safety from drinking the local water for one year with six activities also carried out for one year:

*smoking two packs of cigarettes each day;

*living near a nuclear power plant;

*driving a car for two hours daily;

*riding a bicycle daily;

*having one chest x-ray in one year; and

*eating fruit every day that had been sprayed with pesticides while growing.

Table IX-1: Responses to the Questions, "Is drinking the local water more or less of a threat than smoking two packs a day for one year (living near a nuclear plant for one year; driving a car for two hours a day for one year; riding a bicycle every day for one year; having one chest x-ray in one year; eating fruit every day for one year which was sprayed with pesticides while growing)?"

Before the Cleanup

	Smoking	Nuclear Plant	Car	Bike	X-Ray	Fruit
MUCH MORE	13%	31%	30%	36%	42%	12%
SOMEWHAT MORE	15	33	24	22	28	28
SAME	15	20	11	13	18	43
SOMEWHAT LESS	26	12	22	19	7	12
MUCH LESS	33	3	13	10	5	5
	100%	100%	100%	100%	100%	100%

After the Cleanup

	Smoking	Nuclear Plant	Car	Bike	X-Ray	Fruit
MUCH MORE	4%	7%	10%	16%	17%	5%
SOMEWHAT MORE	14	31	25	25	30	20
SAME	9	26	12	13	22	30
SOMEWHAT LESS	23	25	25	24	21	31
MUCH LESS	50	11	28	23	11	14
	100%	100%	100%	100%	100%	100%
N =	171	170	170	169	169	169
MD =	3	4	4	5	5	5

What is startling in Table IX-1 is the enormous overestimation of the threat from drinking the water in comparison with the voluntary activities of smoking, riding in an automobile, and bicycling. The information provided in the water advisory notice (See Appendix A) seems not to be reflected in citizen responses to the comparative threat questions. Only one-third of the sample checked that drinking the water is much less dangerous than smoking two packs of cigarettes each day. Although the table showed that the threat of death from riding in a car is over twelve times that from drinking the water before the cleanup, over half the sample reported that driving a car is less dangerous than drinking the water.

Before the cleanup, two-thirds viewed drinking the water as more threatening than living near a nuclear power plant. After the cleanup, opinion became equally divided with most repondents finding one only "somewhat more of a threat" than the other and 26 percent viewing them as equally threatening. These moderate views suggests little dread of either drinking the water after the cleanup or living near a nuclear power plant.

Perhaps surprising is the degree to which eating fruit sprayed with pesticides is perceived as threatening. Of the six activities compared with drinking the water, only smoking is perceived as more threatening than eating fruit sprayed with pesticides. In terms of consistency with expert opinion, this finding shows greater consistency than those noted above. But, in the context of the other comparisons that show that drinking the water is viewed as quite threatening, this finding suggests that many respondents perceive eating fruit treated with pesticides as quite dangerous. From some comments made during the oral interviews it is apparent that not all citizens are aware that most "fresh" fruit available in the stores has been treated both with pesticides and post-harvest preservatives. Many people may not make a distinction between toxic chemicals from waste sites and pesticides.

The comparative threat perceptions of drinking the water changed for many respondents at completion of the cleanup. The percentage of respondents who lowered their assessments of the comparative threat from drinking the water ranges from 27 percent (smoking) to 53 percent (living near a nuclear power plant). Because most respondents viewed smoking as more threatening than drinking the water even before the cleanup, there was less room for improvement for post-cleanup perceptions than there was for the other less threatening activities. Most of the changes are slight improvements in the comparative threat perception of drinking the water, i.e., from "much more of a threat" to "somewhat more of a threat" or from more of a threat to "the same."

Table IX-2: Comparative Threat Perceptions Among Groups Before the Cleanup.

	Envmt	Elect	Civic	Busns	Low Ed	Grads
Drinking the Water vs Smoking Two Packs a Day						
MUCH MORE	0%	5%	16%	0%	28%	3%
SOMEWHAT MORE	13	5	16	9	23	7
SAME	9	5	3	5	21	12
SOMEWHAT LESS	35	26	29	27	15	29
MUCH LESS	44	58	36	59	13	48
N =	23	19	31	22	47	58
MD =						1
Drinking the Water vs Living Near a Nuclear Power Plant						
MUCH MORE	26%	42%	29%	41%	40%	21%
SOMEWHAT MORE	35	21	29	14	32	38
SAME	26	16	26	36	17	21
SOMEWHAT LESS	9	16	16	5	9	19
MUCH LESS	4	5	0	5	2	2
N =	23	19	31	22	47	58
MD =						1
Drinking the Water vs Driving a Car for Two Hours Each Day						
MUCH MORE	17%	21%	39%	23%	47%	17%
SOMEWHAT MORE	26	26	19	23	23	24
SAME	4	11	3	9	13	5
SOMEWHAT LESS	39	16	19	18	11	31
MUCH LESS	13	26	19	27	6	24
N =	23	19	31	22	47	59
Drinking the Water vs Riding a Bicycle Daily						
MUCH MORE	30%	22%	40%	32%	57%	20%
SOMEWHAT MORE	22	17	20	14	30	17
SAME	4	17	3	18	4	12
SOMEWHAT LESS	26	28	13	18	7	31
MUCH LESS	17	17	23	18	2	20
N =	23	18	30	22	46	59
MD =		1	1		1	

(continued on next page)

Table IX-2 (continued) Comparative Threat Perceptions

	Envmt	Elect	Civic	Busns	Low Ed	Grads
Drinking the Water vs Having One X-Ray Per Year						
MUCH MORE	22%	32%	52%	14%	53%	31%
SOMEWHAT MORE	48	16	26	46	23	33
SAME	22	26	10	23	11	22
SOMEWHAT LESS	9	16	10	9	4	10
MUCH LESS	0	11	3	9	9	3
N =	23	19	31	22	47	58
MD =						1
Drinking the Water vs Eating Fruit Sprayed with Pesticides						
MUCH MORE	5%	21%	16%	9%	21%	7%
SOMEWHAT MORE	23	11	19	27	43	19
SAME	50	42	45	46	30	46
SOMEWHAT LESS	14	16	7	9	4	18
MUCH LESS	9	11	13	9	2	11
N =	22	19	31	22	47	57
MD =	1					2

The less-well educated consistently overestimate the threat from drinking the water at the site. They stand out in the degree to which they find drinking the water more threatening than anything, even smoking two packs of cigarettes each day. On the other hand, the risk assessments of those with graduate degrees are close to the risk assessments of experts who see little danger in drinking the water.

Among the environmentalists, elected officials, civic activists, and the business community, one might have expected the members of environmental organizations to be particularly concerned with the environmental problem and, therefore, overestimate the risks posed by the site. This is not the case, however, as the environmentalists do not differ greatly from the others. When they do differ, as with the comparison of drinking the water with riding a car, the environmental group members are more consistent with expert opinion than are other Centre Region residents.

Among the other three groups, the civic activists are most likely to overestimate the danger of drinking the water. This group would stand out even more if civic activists who are also environmentalists were removed from the analysis.

When Guttman scaling techniques are used to examine these comparative risk variables no single comparative threat dimension is found. Instead, two scales emerge: one composed of voluntary risks and a second composed of potential environmental risks that are difficult or impossible to avoid. The first scale includes comparisons of drinking the water with smoking, riding in a car, and riding a bicycle - both before and after the cleanup. The second scale includes comparisons of drinking the water with having an annual chest x-ray and eating fruit sprayed with pesticides - again, both before and after the cleanup. The variable that compared drinking the water with living near a nuclear power plant failed to fit into either scale.

Table IX-3: Correlations of Comparative Risk Measures with Demographic Variables.

Drinking the water compared with:	Male	Age	Marital	Incm	Educ
Before the Cleanup					
SMOKING CIGARETTES	-.22**			-.16**	-.35****
LIVING NEAR NUC PLANT					-.13*
RIDING A CAR DAILY	-.15*	-.10*			-.29****
RIDING A BICYCLE DAILY	-.15*				-.34****
ANNUAL X-RAY	-.15*				-.15**
EATING FRUIT					-.27****
After the Cleanup					
SMOKING CIGARETTES	-.16*			-.14*	-.32****
LIVING NEAR NUC PLANT					-.18**
RIDING A CAR DAILY		-.12*			-.31****
RIDING A BICYCLE DAILY	-.14*				-.34****
ANNUAL X-RAY			.12*		-.22***
EATING FRUIT					-.29****

* = significant at .05
** = significant at .01
*** = significant at .001
**** = significant at .0001

The coefficients are tau's, the ordinal analog of Pearson's r. Religiosity and home ownership are not included above because they never correlated significantly with any comparisons.

Table IX-3 illustrates the ability of education level to account for variance in the comparable risk assessments. Although women are somewhat more likely to overestimate the threat from drinking the water vis a vis the other risks that are voluntary and the young somewhat underestimate the danger of riding in automobiles, education level accounts for significant variance in comparative risk assessments. As education level rises, respondents are less worried about drinking the water in comparison with the other threats.

This initial analysis of comparative risk assessments produces several conclusions:

*there is a different underlying attitude toward risks that are voluntary versus those that are involuntary; (this simply confirms much of the work done by Slovic and Fischhoff)

*respondents overestimate the risks of drinking the water from the site, especially before the completion of the cleanup;

*many respondents became less fearful of drinking the water after completion of the cleanup, although substantial minorities still viewed drinking the water as more dangerous than other activities;

*environmental group members are somewhat less likely to overestimate the comparative risk from drinking the water than are the rest of the sample; and

*comparative risk estimates are strongly related to education as the well educated are consistently more likely to make judgments consistent with those of the experts.

SECTION X: THE HYPOTHETICAL SITE - BEHAVIORAL INTENTIONS

When faced with a threat to one's neighborhood, an individual may act to remove the threat, flee the area, or react with some combination of the two. Table X-1 presents the frequencies of these behavioral intentions.

Table X-1: Responses to the Question, "Here is a list of things that people can do in a situation like this. For each activity, select that option that reflects how likely it is that you would engage in that activity.*

1 = I DEFINITELY WOULD DO THIS
2 = I PROBABLY WOULD DO THIS
3 = I PROBABLY WOULD NOT DO THIS
4 = I DEFINITELY WOULD NOT DO THIS

	(1)	(2)	(3)	(4)	N
GET MORE INFORMATION	87%	11%	2%	1%	173
TALK WITH FAMILY AND FRIENDS	79	19	1	1	173
CONVINCE OTHERS TO USE BOTTLED WATER	46	41	12	1	172
SPEAK UP AT A PUBLIC MEETING WITH EPA OFFICIALS	34	41	20	3	171
MARCH IN PROTEST, EVEN IF IT MEANT BEING ARRESTED	10	24	40	27	170
COVINCE OTHERS TO LEAVE AREA	11	29	44	14	170
SERVE ON A COMMITTEE	38	45	16	2	173
GO DOOR TO DOOR TO CONVINCE NEIGHBORS TO GET INVOLVED	19	42	32	8	171
WRITE OR CALL MY CONGRESSMAN TO GET EPA TO REMOVE WASTE	49	30	17	5	173
ORGANIZE A MEETING TO PROTEST THE HANDLING OF THE PROBLEM	16	27	46	11	173
TESTIFY AT A LEGAL HEARING	34	38	23	5	170
BUY BOTTLED WATER	67	25	8	1	172
INSTALL WATER TREATMENT SYSTEM	27	34	31	9	170
MOVE OUT OF THE AREA	17	28	39	13	168
SUE	7	17	52	25	165

*See the appendix for the exact item wording.

If expressing willingness to act is a measure of intensity of concern, these numbers suggest that most respondents think they would be quite concerned with the situation. Almost everyone says that he or she would talk with others and try to get more information. A majority claim they would definitely change their personal habits by drinking bottled water or installing a water treatment system. Forty-five percent probably or definitely would leave the area. Not only do these citizens claim they would take personal action, most say they would encourage others to take action; majorities would urge their friends to use bottled water and would go door to door themselves to convince their neighbors to get involved with the problem. Forty percent say they probably or definitely would try to convince their friends to leave the area. However, these numbers probably overstate what people actually would do since the costs of indicating a behavior on a questionnaire are considerably less than the costs of actually engaging in that behavior.

Besides talking about the problem, changing their personal behavior, and urging others to act, majorities claim they definitely or probably would take political action to change the situation. Majorities checked that they definitely or probably would contact Congress to put pressure on EPA, speak up at a public meeting, and testify at a legal hearing. Forty-three percent claimed they would organize a meeting to protest the handling of the situation and thirty-four percent said they would march in a protest picket line, even if it meant being arrested.

The only item listed that failed to generate substantial support is litigation. Several respondents noted that the problem with this option is that the scenario did not clarify who could be a successful target of litigation. They said they were not opposed to supporting litigation to force faster action, but did not see how this would be possible.

All of the items from Table X-1 were submitted to a Guttman scaling program. What emerged was four scales that covered the different dimensions of citizen actions:

*a three-variable scale (labelled TALK), that includes getting more information, talking about the problem, and serving on a committee, these acts do not require a public commitment or great changes;

*another three-variable scale (labelled OTHERS), that involves convincing others to: use bottled water, get involved in the problems, and leave the area;

*a third three-variable scale (labelled PERSONAL), that includes using bottled water, buying a water treatment system, and moving out of the area; and

*a five-variable scale (labelled POLITICAL), that involves contacting Congress, speaking up at a public meeting, marching, organizing a protest meeting, and testifying.

The scale scores from these scales combine into an overall scale of behavioral intentions. The order of the scales is TALK, PERSONAL, OTHERS, AND POLITICAL. This means that if an individual scored highly on the POLITICAL scale, that person very likely scored highly on all the other scales. Conversely, if an individual did not score highly on the TALK scale, it is unlikely that he or she would have claimed intentions to change water uses, to convince others to make changes, or to become highly active politically. These scales will be used in the multivariate analysis of section XII.

Table X-2: Behavioral Intentions Among Groups.

% who would definitely engage in the activity

	Envmt	Elect	Civic	Busns	Lo-Ed	Grads
GET MORE INFORMATION	91%	100%	97%	91%	89%	90%
TALK WITH FRIENDS	83	95	77	86	85	83
CONVINCE OTHERS TO USE BOTTLED WATER	44	42	39	36	54	38
SPEAK UP AT A PUBLIC MEETING WITH EPA	39	53	52	41	39	33
MARCH IN PROTEST EVEN IF ARRESTED	9	11	13	9	7	12
CONVINCE OTHERS TO MOVE	13	0	16	9	11	7
SERVE ON A COMMITTEE	52	58	58	46	37	39
GO DOOR TO DOOR TO GET NEIGHBORS INVOLVED	23	26	27	10	17	19
CONTACT CONGRESS TO PRESSURE EPA	52	63	61	46	61	39
ORGANIZE A MEETING	17	32	29	27	11	19
TESTIFY AT A HEARING	26	63	42	41	37	32
BUY BOTTLED WATER	61	74	65	59	80	53
INSTALL WATER TREATMENT SYSTEM	13	37	26	29	39	19
MOVE OUT OF AREA	18	5	19	9	26	11
SUE	5	5	10	0	13	4
N =	23	19	31	22	47	59

Members of environmental groups might be expected to engage more heavily in activities to deal with the problem than others. After all, by joining a local environmental group people assert their concern with environmental protection and their willingness to participate in group activities. These expectations are not borne out by the data of Table X-2. Variations are greater among the items (e.g., intend to sue) than among the groups. In other words, the similarities among the groups far outweigh the differences reported in Table X-2. These results must be viewed with caution since the number of respondents in some of the groups is quite small.

The decision to take specific actions is a function of one's level of concern with the problem, assessment of the likelihood that the action will be effective, and the extent one feels comfortable with the activity. Some individuals, for example, said that they would never walk in a protest march, regardless of their level of concern.

The scenario of this study creates a situation which, as reported in Section VII, would greatly concern the vast majority of the respondents. In this situation almost everyone becomes an environmentalist concerned with protecting the health and safety of themselves and their families. The great variations among activities appear to be a function of their perceived appropriateness and effectiveness, rather than previous exposure to environmental literature or general level of concern.

Although, as reported in previous sections, the less well-educated express the most concern about the situation and the greatest inconsistency with expert risk assessments, they are not the most likely to engage in every activity. The activities that require working with others in an organized manner (committee service; organizing meetings) have a lower level of participation among the less well-educated than among members of the four groups who are presumably more used to attending meetings (environmentalists, elected officials, civic leaders, and business persons). The respondents in the sample with graduate degrees also are less willing to engage in these activities. In light of the fact that the members of the first four groups chose to join organizations, perhaps it is not surprising that they look to an organizational approach in dealing with the waste problem.

The less well-educated are the most willing to take individual actions to protect themselves and to try to convince others to do so. They are the most willing to buy bottled water and to flee the area.

Section VI reports that elected officials are disproportionately trusting of EPA representatives. This does not discourage these elected officials, however, from contacting Congress to pressure EPA to remove all the waste immediately. Majorities of every group, except the business community and the well-educated, claim that they definitely would contact their local representative. The less well-educated may have doubts about engaging in committee work, but they have few qualms about contacting Congress.

Different dimensions of activity have different demographic correlates. The scale that involves getting more information and serving on a committee correlates with home ownership. People who own their own homes are more likely to state that they intend to engage in this type of traditional citizen activity. Changing one's personal behavior -- using bottled water, installing a water treatment system, and even leaving the area -- correlates negatively with education and male gender.

Women and the less well-educated are more likely to react by adopting these strategies designed to protect the family's health. Encouraging others not to drink the water and to get involved is primarily correlated with gender; women are more likely to say that they would encourage others to drink bottled water, to get involved, and even to get others to move.

Table X-3: Correlations of Behavioral Intentions with Demographic Variables.

	Age	Male	Relg	Marital	Home	Incm	Educ
GET MORE INFO					.13*		
GET OTHERS TO USE BOTTLED WATER		-.12*					
MARCH IN A PROTEST			-.11*				
GET OTHERS TO MOVE		-.23**					-.14*
SERVE ON COMMITTEE				.16*	.16*		
GO DOOR TO DOOR TO INVOLVE NEIGHBORS		-.13*			.13*		
CONTACT CONGRESS TO PRESSURE EPA						-.11*	-.13*
BUY BOTTLED WATER		-.17*					-.18**
INSTALL WATER TREATMENT SYSTEM							-.17**
LEAVE THE AREA	-.13*		-.12*				-.15*

* = significant at .05
** = significant at .01

The five political items all involve a public commitment to influence events at the site. The findings regarding the political items are different from those relating to the other activities in that propensity to engage in the political activities is rarely related at all to any of the demographic variables. The three activities related to meetings - speaking up, organizing, and testifying - do not correlate with any of the demographic variables. Contacting Congress correlates weakly and negatively with income and education; the lower the income and education, the more the intention to contact Congress. Marching in a protest only correlates with one variable; negatively with religiosity. Attendance at church services seems weakly to depress the intention to march.

This initial description of the behavioral intentions produces several conclusions:

*most respondents say that they definitely would engage in the traditional, low-commitment activities of getting more information, talking about the problem, and serving on a committee;

*most respondents say that they would definitely use bottled water, and many say they would take other steps to protect their families such as installing a water treatment system or even leaving the area;

*most people would try to convince others to get involved and to use bottled water;

*most would take political actions, with the most popular option being contacting their representative in Congress to put pressure on EPA;

*behavioral intentions fall into four dimensions that scale in likelihood from talking about the problem, to taking personal steps to protect the family's health, to convincing others to confront the problem, and finally to taking political actions designed to put pressure on the government;

*members of environmental groups are not more likely than anyone else to take action - when faced with a toxic waste problem near one's home, almost everyone becomes greatly concerned;

*the less well educated and women are the most likely to drink bottled water and take other steps to protect their health, but they are not more likely to engage in most other activities;

*the political behavioral intentions rarely correlate with any of the demographic variables, suggesting that other factors influence personal decisions to participate.

The next section of this report looks at how these "other factors" - including uncertainty communications and management options - account for variance in key citizen attitudes and intentions.

SECTION XI: EXPLAINING THE RESULTS - BIVARIATE RELATIONSHIPS

The first ten sections of the report have explained the research, presented the measures, and reported the results in terms of frequencies, variations among the six subgroupings, and correlations with demographic varaibles. This section is an examination of the bivariate relationships that may account for variance in four sets of variables:

*levels of concern, correlations with health risk assessments, comparative risk assessments, trust, and the uncertainty communications and management options variables;

*health risk assessments, correlations with trust, and the uncertainty communication and management option variables;

*comparative risk assessments, correlations with trust, and uncertainty communication and management options variables; and,

*behavioral intentions, correlated with all the above listed factors.

The next section is a multivariate analysis of these factors along with prior attitudes and demographic attributes. In this section the intent is to examine simple relationships among factors measured after respondents read the hypothetical waste site scenario.

Levels of Concern

Table XI-1, on the next page, shows that levels of concern are strongly related to risk assessments. Levels of concern are most strongly a function of a person's assessment of the likelihood of health problems developing as a result of living near the site. Levels of concern are not just a function of an assessment of the likelihood of sickness, but also are a function of how dangerous the respondent views living near the site in comparison with other possible threats to a person's health and safety.

The strong relationships between risk assessments and levels of concern support the arguments of those who stress the importance of risk communications to effective implementation of environmental statutes. When there is a substantial gap between objective and subjective risk estimates, the result is a level of concern inappropriate to the given risk.

In all instances, the correlation regarding judgments of the situation after the cleanup is stronger than the correlation regarding judgments before the cleanup. This results from an attenuation of correlation from the lack of great variance in levels of concern before the cleanup; with most respondents reporting themselves extremely concerned, correlations involving levels of concern cannot attain high levels. With more variance in opinions after the cleanup, higher correlations are possible.

Table XI-1: Correlations of Levels of Concern with Risk Assessments

Risk Assessments Before Cleanup

PROBABILITY OF HAVING PERSONAL HEALTH PROBLEMS	.46****
PROBABILITY OF HAVING FAMILY HEALTH PROBLEMS	.50****
THREAT OF LIVING NEAR SITE VS SMOKING	.29****
THREAT OF LIVING NEAR SITE VS NEAR NUCLEAR PLANT	.15*
THREAT OF LIVING NEAR SITE VS DRIVING A CAR	.31****
THREAT OF LIVING NEAR SITE VS RIDING A BICYCLE	.27****
THREAT OF LIVING NEAR SITE VS ANNUAL CHEST X-RAY	.27****
THREAT OF LIVING NEAR SITE VS EATING SPRAYED FRUIT	.19**

Risk Assessments After Cleanup

PROBABILITY OF HAVING PERSONAL HEALTH PROBLEMS	.58****
PROBABILITY OF HAVING FAMILY HEALTH PROBLEMS	.59****
THREAT OF LIVING NEAR SITE VS SMOKING	.39****
THREAT OF LIVING NEAR SITE VS NEAR NUCLEAR PLANT	.29****
THREAT OF LIVING NEAR SITE VS DRIVING A CAR	.38****
THREAT OF LIVING NEAR SITE VS RIDING A BICYCLE	.37****
THREAT OF LIVING NEAR SITE VS ANNUAL CHEST X-RAY	.33****
THREAT OF LIVING NEAR SITE VS EATING SPRAYED FRUIT	.22***

* = significant at the .05 level
** = significant at the .01 level
*** = significant at the .001 level
**** = significant at the .0001 level

(These significance levels will be used in the remaining tables in this section. The coefficients are tau's.)

Although the correlation coefficients are not as high, level of concern is also a function of the level of trust respondents have in government, industry, and the possibility to control a problem like this one so that it presents little or no health threat to the community. Table XI-2 shows these relationships, and reveals that the reduction in the level of concern brought about by the cleanup is also a function of trust. Those individuals who trust the government, industry, and the possibility of managing a hazardous waste site without threatening the health of the community have a greater reduction in their level of concern with living near the site at the completion of the cleanup than do less trusting individuals.

Table XI-2: Correlations of Levels of Concern with Trust

1 = Level of concern before cleanup
2 = Level of concern after cleanup
3 = Decrease in concern with the cleanup

	(1)	(2)	(3)
LOCAL OFFICIALS TELL TRUTH	-.16*	-.29****	.28****
STATE OFFICIALS TELL TRUTH	-.17*	-.34****	.33****
FEDERAL OFFICIALS TELL TRUTH	-.16*	-.32****	.31****
POSSIBLE TO CONTROL THE PROBLEM	-.17*	-.25****	.18**
ENVIRNMENT SAFER THAN 30 YRS AGO	-.23***	-.36****	.31****
FEDS MORE HONEST THAN 30 YRS AGO		-.14*	.17**
STATE MORE HONEST THAN 30 YRS AGO		-.20**	.20**
SCIENTISTS KNOW HOW TO PROTECT US			
INDUSTRIES CONCERNED WITH HEALTH	-.24***	-.20**	.13*
STATE & FEDS CONCERNED WITH HEALTH		-.19**	.23***

The dimensions of trust discussed in Section VI include the question of whether scientists know enough about the impact of chemicals on our health to adequately protect us. This variable stands out in Table XI-2 by its failure to correlate with level of concern. The general question of what scientists know simply is unrelated to how concerned citizens would be living within one mile of the site. On the other hand, level of concern is related to judgments of whether it is possible to manage a hazardous waste site safely. These two findings, along with the strong relationships between trust in institutions and level of concern, suggest that the respondents' evaluations are driven more by concern with institutional capabilities than by concerns with the limitations of science.

Finally, regarding bivariate relations with level of concern, the impact of the uncertainty communications (uncertainty disclaimer or not) and the management options (standard, enhanced participation, or indemnification) is nonexistent. There is no relationship between which uncertainty communication was given, nor which management option was chosen, and level of concern (See Appendix A for the text of these messages). Instead, consistency between objective and subjective risk, the lower levels of concern, relates strongly to lower health risk estimates, to lower comparative risk estimates, and to trust in institutions and in the belief that it is possible to clean up the site with low risk to the health and safety of the community.

Health Risk Assessments

Table XI-3 demonstrates that how people assess the likelihood of their becoming sick from living near the site is strongly related to the trust measures. With the exception of the item that measures the belief that scientists know enough about the impact of chemicals on our health to adequately protect us, every trust item significantly correlates with health risk assessments. People who trust institutions and think it is possible to manage the site without risking the community's health have risk assessments similar to those of the experts. Individuals with low trust considerably overestimate the risks from living near the site. Individuals with higher trust are also more likely to substantially reduce their health risk assessments with the completion of the cleanup; individuals with lower trust are less willing to believe that the cleanup reduced their risk from living near the site.

Table XI-3 includes only the results for the question of the respondent suffering health problems, not his or her family. The results for the family question are almost identical so they are not reported.

Table XI-3: Correlations of Health Risk Assessments with Trust

1 = Probability of illness before cleanup
2 = Probability of illness after cleanup
3 = Decrease in probability of illness with the cleanup

	(1)	(2)	(3)
LOCAL OFFICIALS TELL TRUTH	-.20**	-.30****	.16**
STATE OFFICIALS TELL TRUTH	-.27****	-.38****	.21***
FEDERAL OFFICILS TELL TRUTH	-.19**	-.32****	.21***
POSSIBLE TO CONTROL THE PROBLEM	-.17*	-.29****	.21***
ENVIRNMNT SAFER THAN 30 YRS AGO	-.23***	-.25****	.14*
FEDS MORE HONEST THAN 30 YRS AGO	-.15*	-.16*	
STATE MORE HONEST THAN 30 YRS AGO	-.19**	-.20**	
SCIENTISTS KNOW HOW TO PROTECT US			
INDUSTRIES CONCERNED WITH HEALTH	-.14*	-.20**	.13*
STATE & FEDS CONCERNED WITH HEALTH		-.21**	.21**

The uncertainty risk communication and the managment option variables have no direct impact on health risk assessments. Regardless of whether the respondent received the uncertainty disclaimer or which of the three management options were presented, there is no impact on health risk assessments.

Comparative Risk Assessments

Trust not only relates to assessments that one will become sick from living near the site, but also with the comparative risk assessments. Table XI-4 presents the correlation coefficients of the comparative risk assessments with trust after the cleanup was completed. Coefficients for before the cleanup are similar, but slightly lower due to the reduced variance in the comparative risk assessments which was explained earlier.

Table XI-4: Correlations of Comparative Risk Assessments with Trust, After Cleanup

1 = Threat of living near site vs smoking
2 = Threat of living near site vs near nuclear plant
3 = Threat of living near site vs driving a car
4 = Threat of living near site vs riding a bicycle
5 = Threat of living near site vs annual chest x-ray
6 = Threat of living near site vs eating sprayed fruit

	(1)	(2)	(3)
LOCAL OFFICIALS TELL TRUTH	-.28****	-.25****	-.23***
STATE OFFICIALS TELL TRUTH	-.26****	-.21***	-.28****
FEDERAL OFFICIALS TELL TRUTH	-.20**	-.19**	-.27****
POSSIBLE TO CONTROL THE PROBLEM	-.11*	-.12*	-.14*
ENVRNMNT SAFER THAN 30 YRS AGO	-.20***		-.14*
FEDS MORE HONEST THAN 30 YRS AGO			-.11*
STATE MORE HONEST THAN 30 YRS AGO			-.15*
SCIENTISTS KNOW HOW TO PROTECT US		-.11*	
INDUSTRIES CONCERNED WITH HEALTH	-.12*	-.16**	-.18**
STATE & FEDS CONCERNED W/ HEALTH	-.19**		-.19**

	(4)	(5)	(6)
LOCAL OFFICIALS TELL TRUTH	-.21***	-.24****	-.17**
STATE OFFICIALS TELL TRUTH	-.25****	-.14*	-.17**
FEDERAL OFFICILS TELL TRUTH	-.25****	-.18**	-.17**
POSSIBLE TO CONTROL THE PROBLEM	-.14*	-.17**	
ENVRNMNT SAFER THAN 30 YRS AGO	-.14*	-.11*	-.12*
FEDS MORE HONEST THAN 30 YRS AGO			
STATE MORE HONEST THAN 30 YRS AGO			
SCIENTISTS KNOW HOW TO PROTECT US			
INDUSTRIES CONCERNED WITH HEALTH	-.21***	-.19**	-.15*
STATE & FEDS CONCERNED W/ HEALTH	-.16**	-.11*	

The strongest relationships are between the comparative risk assessment from living near the site and trusting government officials to tell the truth. In comparing living near the site with the other activities, people who trust the government to tell them the truth perceive the risk from living near the site to be less dangerous than do the people who do not trust government. This holds across all six comparisons, whether voluntary activities such as smoking or relatively involuntary ones such as eating fruit sprayed with pesticides.

How effective one views the cleanup in reducing the risk of living near the site in comparison with other risks is also a function of trust in government. Table XI-5 on the next page presents the correlation coefficients between changes in risk assessments and the trust variables. Change is categorized as either none or some improvement in the comparative assessment of the risk of living near the site. Individuals who viewed living near the site as less risky than the other activity before the cleanup are excluded from the analysis. This accounts for the different sample sizes reported in the table. The sample size for the comparison with smoking is the lowest because most respondents perceived smoking two packs of cigarettes each day as more dangerous than living near the site. For each of the other comparisons, prior to the cleanup, respondents viewed living near the site to be riskier.

Table XI-5: Correlations of Change in Comparative Risk Assessments with Trust, After Cleanup Completion

1 = Threat of living near site vs smoking
2 = Threat of living near site vs near nuclear plant
3 = Threat of living near site vs driving a car
4 = Threat of living near site vs riding a bicycle
5 = Threat of living near site vs annual chest x-ray
6 = Threat of living near site vs eating sprayed fruit

	(1)	(2)	(3)
LOCAL OFFICIALS TELL TRUTH	.23*	.15*	
STATE OFFICIALS TELL TRUTH		.16*	
FEDERAL OFFICIALS TELL TRUTH	.24*	.21*	.20*
POSSIBLE TO CONTROL PROBLEM	.24*	.17*	.18*
ENVRNMNT SAFER THAN 30 YRS AGO	.20*	.14*	
FEDS MORE HONEST THAN 30 YRS AGO			
STATE MORE HONEST THAN 30 YRS AGO			
SCIENTISTS KNOW HOW TO PROTECT US		.13*	
INDUSTRIES CONCERNED WITH HEALTH			
STATE & FEDS CONCERNED W/ HEALTH			
N =	69	141	109

	(1)	(2)	(3)
LOCAL OFFICIALS TELL TRUTH			.15*
STATE OFFICIALS TELL TRUTH			
FEDERAL OFFICIALS TELL TRUTH	.15*		.16*
POSSIBLE TO CONTROL THE PROBLEM		.20**	.22**
ENVRNMNT SAFER THAN 30 YRS AGO		.16*	.16*
FEDS MORE HONEST THAN 30 YRS AGO			
STATE MORE HONEST THAN 30 YRS AGO			
SCIENTISTS KNOW HOW TO PROTECT US		.14*	.15*
INDUSTRIES CONCERNED WITH HEALTH			
STATE & FEDS CONCERNED W/ HEALTH			
N =	119	145	135

The strongest relationships between trust and changing opinions with the completion of the cleanup involve believing that the federal officials are telling the truth and thinking that it is possible to manage a situation like this one with little or no threat to public health. This is logical; people who think that government is lying to them and that the problem cannot be managed without threatening public health have little reason to conclude that the cleanup reduces their risk of health problems from living near the site.

As with levels of concern and health risk assessments, the managment options fail to account for any variability in comparative health risk assessments. The uncertainty communications variable, however, does correlate slightly with most of the comparative risk assessments. Having the uncertainty disclaimer seems to reduce the degree to which living near the site is seen as more threatening than the other activities. The strongest correlation coefficients are with living near the site compared with smoking cigarettes: -0.18 (before the cleanup) and -0.17 (after the cleanup), both significant at the .01 level. The three other significant coefficients are -0.12 with driving a car, after cleanup; -0.14 with having a x-ray, before the cleanup; and -0.13 with eating sprayed fruit, before the cleanup. This suggests that providing the disclaimer has a slight impact on improving consistency between expert and popular opinion in comparative risk assessments. Section XII, the multivariate analysis, provides a more detailed assessment of the impact on this factor.

Behavioral Intentions

Different behavioral intentions correlate with many individual measures of levels of concern, health risks, comparative health risks, and trust. Table XI-6 shows the single measure of levels of concern, health risks, and comparative health risks, respectively, that in general correlates most highly with the behavioral intentions. In other words, rather than present the correlations of the behavioral intentions measures with all ten trust measures, the table includes only one trust variable, how much can federal officials be trusted to tell the truth. This variable was chosen because it is the trust variable that correlates most highly in most cases with the behavioral intentions measures.

Simple bivariate measures of levels of concern, health risk assessments, and comparative health risk assessments account for substantial variation in respondent intentions to take action to deal with the problem. The relationships are strongest for behavioral intentions involving private reactions to the problem (e.g., using bottled water or convincing others to use bottled water) and slightly less strong for political responses (e.g., contacting Congress). Trusting federal officials is related to behavioral intentions although the correlation coefficients are much lower.

Receiving the uncertainty disclaimer seems to slightly decrease the likelihood of certain political reactions as evidenced by correlations of -0.17 with protest marching; -0.16 with contacting Congress; and -0.15 with litigating. Some behavioral intentions are also slightly

Table XI-6: Correlations of Behavioral Intentions with Selected Measures of Levels of Concern, Health Risks, Comparative Health Risks, and Trust

1 = Level of concern, after the cleanup
2 = Probability of illness, after the cleanup
3 = Threat from living near the site vs driving a car
4 = Trust federal officials to tell the truth

	(1)	(2)	(3)	(4)
GET MORE INFORMATION	.16*	.16*		
TALK WITH FAMILY AND FRIENDS	.15*			
CONVINCE OTHERS TO USE BOTTLED WATER	.36****	.38****	.23***	
SPEAK UP AT A PUBLIC MEETING WITH EPA OFFICIALS	.21**	.18**	.12*	-.13*
MARCH IN A PROTEST, EVEN IF IT MEANT BEING ARRESTED	.24***	.20**	.22***	-.17**
CONVINCE OTHERS TO LEAVE	.50****	.46****	.39****	-.21***
SERVE ON A COMMITTEE	.22*	.18**	.15**	-.17**
GO DOOR TO DOOR TO CONVINCE NEIGHBORS TO GET INVOLVED	.26****	.25****	.19**	
WRITE OR CALL MY CONGRESSMAN TO GET EPA TO REMOVE WASTE	.23***	.15*	.17*	-.14*
ORGANIZE A PROTEST MEETING	.24***	.21***	.24****	-.14*
TESTIFY AT A LEGAL HEARING	.23*	.15*	.17**	-.15*
BUY BOTTLED WATER	.30****	.36****	.24***	
INSTALL WATER TREATMENT SYSTEM	.23***	.15*	.13*	
MOVE OUT OF AREA	.40****	.37****	.36****	-.16*
SUE	.33****	.28****	.26****	-.14*

related to one of the managment options; the indemnification option is positively related to serving on a committee (0.16). One explanation for this result comes from one respondent who said, "If they are willing to buy out my house, I don't care what they said in the official notice, the problem must be horrible." For some people, the willingness to provide indemnification did not provide comfort, but communicated a message that the danger of living near the site was indeed high.

SECTION XII: EXPLAINING THE RESULTS: MULTIVARIATE ANALYSIS

The goal of this section is to delineate the major correlates of the primary dependent variables. This will be accomplished by using stepwise multiple regression techniques. This technique enters variables in the order of their importance in accounting for variation in the particular dependent variable. The discussion for each dependent variable will follow the same format: first, the analysis will be presented, including all the independent variables that individually account for at least one additional percent of explained variance in the step-wise regression; then, a regression analysis will be presented that isolates the four sets of dependent variables. Figure 1 summarizes

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FIGURE 1: A SUMMARY OF THE VARIABLES USED IN THE MULTIVARIATE ANALYSIS

DEPENDENT VARIABLES

LEVEL OF CONCERN
(a two-item scale)

HEALTH RISK ASSESSMENTS
(a four-item scale)

COMPARATIVE RISK JUDGMENTS
- A. Voluntary Risks (a six-item scale)
- B. Life Risks (a four item scale)

BEHAVIORAL INTENTIONS
- A. Actions (A Scale composed of the following four scales)
- B. Talk (a three-item scale)
- C. Personal (a three-item scale)
- D. Others (a three-item scale)
- E. Political (a five-item scale)

INDEPENDENT VARIABLES

PRIOR ATTITUDES & INVOLVEMENT
- A. Prior Concern (one item)
- B. Prior Sickness (two item scale)
- C. Know Chemicals (two item scale)
- D. Prior Involvement (a two-item scale)

TRUST
- A. Trust Locals (a two-item scale)
- B. Trust Government (a six-item scale)
- C. Trust Science (one item)
- D. Possible to Control (one item)

DEMOGRAPHICS
- A. Female
- B. Education
- C. Age
- D. Income
- E. Attends Religious Service
- F. Married

RISK COMMUNICATION AND MANAGEMENT OPTIONS
- A. Uncertainty Disclaimer
- B. Enhanced Citizen Participation
- C. Indemnification
- D. Standard Procedures

these variables. First, however, the impact of the quasi-experimental manipulations will be explained.

The Results of the Message Manipulations

Recall that the quasi-experimental design consisted of manipulating information about the uncertainty inherent in risk estimates and three management scenerios (refer to Section III). The test for message impacts is a basic two-way analysis of variance for various dependent variables. Two-way analysis of variance using concern, risk assessments, and behavioral intentions demonstrated no significant F-ratios for either main effects or interaction effects (the F-ratio is a measure of statistical significance in an analysis of variance). The message manipulations had no dramatic impact on any of the dependent variables.

However, when separately correlated with other indices two aspects of the message manipulation demonstrated relatively weak, but consistent, relationships: whether the respondent received the uncertainty information; and, whether the respondent got the indemnification management scenario. The effect of the former was in the expected direction while the effect of the latter was contrary to expectations:

*the presence of the uncertainty information appears to increase message credibility, and therefore trust, for some respondents;

*and, the presence of the indemnification scenerio appears to act as a signal that the situation is really serious and increases concern and resolve to get out for some respondents.

Although the impact of these variables is relatively small they do come into play in the multiple regression analysis when entered as dummy variables (present or absent). This will be discussed in the next sections.

Accounting for Concern

As discussed earlier, many of the variables discussed subsequently are scales composed of multiple items. When we say "scale," we mean that the measure has a coefficient of reproducibility of at least .90 and scaleability of at least .60, by Guttman criteria.

Concern, as a dependent variable, is made up of two items: how concerned the individual would be about living near the site, before and after the cleanup. Table XII-1 presents the results of the stepwise regression for the dependent variable "concern."

Table XII-1: The Regression Analysis for "Concern"

"CONCERN" as the Dependent Variable

Ind. Vars.	Multiple R	R^2Change	Simple R	Beta
TRUST LOCALS	.388	.151	-.388	-.259
TRUST GOVERNMENT	.416	.022	-.303	-.136
PRIOR INVOLVEMENT	.436	.017	.100	.134
KNOW CHEMICALS	.455	.017	-.150	-.117
MARRIED	.468	.012	-.076	-.206
INCOME	.486	.017	-.130	-.138
POSSIBLE TO CONTROL	.496	.010	-.210	-.090
PRIOR CONCERN	.503	.008	.180	.100
EDUCATION	.509	.005	-.120	-.071

Multiple R= .51
R^2 = .26

(Note: Beta is a standardized slope coefficient).

In the above table the order of the variables indicates their relative importance in accounting for variance in the dependent variable. The Multiple R is the cumulative correlation of the independent variable(s) with the dependent variable while the Simple R is the zero-order correlation between the single independent and the dependent variable. Note that the Multiple R and the Simple R is identical for the first independent variable. The R^2Change is a coefficient indicating how much additional explained variance is accounted for by the independent variable. Beta is a standardized slope coefficient indicating the relative change in Y, the dependent variable, for each unit change in X, an independent variable.

In these tables the first few variables account for most of the explained variance. "Concern" is primarily the result of two trust scales: trust locals and trust government. Trust locals is a scale with two variables: trust in local officials and the belief that industry is seriously interested in protecting public health. Trust government is a scale with six variables: trust DER to tell the truth; trust EPA to tell the truth; the U.S. is safer now than it was 30 years ago; the Federal Government is more honest now than 30 years ago; the DER is more honest now than 30 years ago; and, Federal and State agencies are seriously interested in protecting public health. The following variables have a lesser impact:

*prior information and involvement;

*levels of knowledge about the two chemicals of interest;

*marital status;

*income;

*belief that it is possible to control such a problem;

*prior concern with hazardous waste, and

*education.

Another useful way of decomposing this data is to regress the four major sets of independent variables on the dependent variable to assess their relative impact on the explained variance. The four major sets of independent variables are: prior attitudes and involvement; trust; demographics; and the risk communication - managment options.

*Prior attitudes and involvement is measured by three scales and a single measure of levels of concern. The scales measure beliefs that waste sites are causing much illness, knowledge of specific chemicals, and prior involvement in hazardous waste issues.

*Trust is measured by two scales and two single variables assessing trust in local government and industry, trust in other government bodies, and trust in science and the management of risk (because there is no overall scale, the statement that the relation between trust and level of concern is .43 means that the multiple r between these trust measures and concern is .43.

Table XII-2: Concern as the Dependent Variable

(NOTE: Explained variance with all variables included = 26%)

	MULTIPLE R
ALL VARIABLES	.51
PRIOR ATTITUDES AND INVOLVEMENT	.27
TRUST	.43
DEMOGRAPHICS	.29
RISK COMMUNICATIONS AND MANAGEMENT OPTIONS	.08
ALL, MINUS PRIOR ATTITUDES AND INVOLVEMENT	.48
ALL, MINUS TRUST	.38
ALL, MINUS DEMOGRAPHICS	.47
ALL, MINUS RISK COMMUNICATION AND MANAGEMENT OPTIONS	.51

Additional Explained Variance Accounted for By Variable Set

PRIOR ATTITUDES AND INVOLVEMENT	3%
TRUST	12%
DEMOGRAPHICS	4%
RISK COMMUNICATIONS AND MANAGEMENT OPTIONS	0%
SHARED VARIANCE (two or more variable sets)	7%

*Demographics is made up of the following six variables: female gender, education, age, income, level of attendance at religious services, and marital status.

*Risk communication and managment options are the four dummy variables based on whether the respondent received the uncertainty manipulation, the indemnification management scenario, the enhanced citizen participation option, and the standard management procedures.

Table XII-2 presents the results of regressing the above four variable sets on concern together and in combinations. In these types of tables the first coefficient is the strength of the relationship of all the independent variables with particular dependent variable under scrutiny. The next four coefficients are the strength of the relationship of each set of independent variables, by itself, with the dependent variable. The following four coefficients are the strength of the relationship of all the independent variables when one set has been removed from the analysis. This gives another picture of the relative impact of the variable. The last five coefficients are the percentage of additional variance explained by each variable set. The shared variance indicates that some of the explained variance is an interaction of more than one set of independent variables.

The above analysis highlights the importance of trust in accounting for concern. Trust explains an additional 12 percent of the variance by itself. No other variable set comes close to trust in importance. One's level of concern is more a function of whether one trusts various governments and the management process than of other factors. If trust is absent,then the manipulation of information will have little impact. Without a credible communicator there can be no information defined as "objective."

Accounting for Health Risk Assessments

Another, more specific, dimension of people's reactions to toxic waste sites is their fears about health problems. This dependent variable is a four item scale we simply lable "health": how likely is it that you (separately) and your family would get sick from living near the site both before and after cleanup. Table XII-3 presents the regression analysis for this dependent variable.

In the above table female gender has the strongest relationship with "health." This is consistent with many other studies demonstrating that women have more concern about a large variety of risks (Warr,1985) The trust variables again make a significant contribution to explained variance as does the respondent's level of information about the key chemicals. Two previously undetected variables emerge in this analysis: prior sickness and the uncertainty disclaimer. Prior sickness is a two variable scale encompassing the respondent's judgement of how many adult cancers in 100 are caused by chemicals from toxic waste sites and whether the respondent feels he or she has experienced chemically

Table XII-3: Regresssion Analysis for "Health."

"HEALTH" AS THE DEPENDENT VARIABLE

Ind. Vars.	Multiple R	R^2Change	Simple R	Beta
FEMALE GENDER	.357	.127	.357	.215
TRUST LOCALS	.451	.076	-.323	-.206
EDUCATION	.493	.040	-.258	-.179
KNOW CHEMICALS	.516	.023	-.279	-.154
PRIOR SICKNESS	.531	.016	.221	.128
TRUST GOVERNMENT	.545	.014	-.303	-.122
UNCERTAINTY DISCL.	.555	.012	.010	.114
AGE	.564	.010	.024	.100

Multiple R = .57
R^2 = .33

induced illnesses. The summary of the above table is as follows:

*women make less accurate health risk estimates than do men;

*not trusting local government raises estimates that illness will result from living near the site;

*higher education is associated with lower health risk estimates;

*knowing the chemicals is associated with lower health risk estimates;

*prior judgments characterized by overestimating the health risks of toxic chemicals are associated with overestimates from the hypothetical site;

*not trusting state and federal governments is associated with higher health risk estimates;

*being older is associated with higher health risk judgments.

Again, the explained variance (R^2=.33) is substantial. Table XII-4 presents the results of regressing the four major independent variable sets, prior involvement and concern, trust, demographics, and the risk communications and management options, on health risk assessements.

As before, trust makes a significant contribution to the explained variance. However, the demographics are much more important for health

Table XII-4: Regression Analysis with Health Risk Assessment as the Dependent Variable Regressed on the Four Major Independent Variables.

(NOTE: Explained variance with all the variables included = 33%)

	Multiple R
ALL VARIABLES	.58
PRIOR ATTITUDES AND INVOLVEMENT	.36
TRUST	.42
DEMOGRAPHICS	.42
RISK COMMUNICATIONS AND MANAGMENT OPTIONS	.06
ALL, MINUS PRIOR ATTITUDES AND INVOLVMENT	.55
ALL, MINUS TRUST	.49
ALL, MINUS DEMOGRAPHICS	.49
ALL, MINUS RISK COMMUNICATIONS & MANAGEMENT OPTIONS	.57

Additional Explained Variance Accounted for by Variable Set

PRIOR ATTITUDES AND INVOLVEMENT	3%
TRUST	9%
DEMOGRAPHICS	9%
RISK COMMUNICATION AND MANAGMENT OPTIONS	1%
SHARED VARIANCE (two or more variable sets)	11%

risk assessments than they were for "concern." Gender plays the most important role among the demographics. Women overestimated sickness possibilities much more than did men. Prior attitudes and involvement also contribute substantially to the explained variance.

Accounting for Comparative Risk Judgments

Recall that a previous discussion indicated that the comparative risk judgments, comparing the risk of drinking the water with nine more conventional risks before and after cleanup, broke down into two scales: one involved with voluntary risks such as smoking, car riding, and bike riding; and, one involved with risks that are difficult to avoid such as getting an X-Ray and eating fruit sprayed with toxics. Tables XII-5 and XII-6 present the regression analysis for these two scales. The results shown in these two tables are reasonably consistent. Level of education accounts for most of the variance in the comparative risk estimates. This simply means that those with higher education are making more accurate risk judgments. On the other hand, unreasonably high estimates of the risk of drinking the water are associated with distrust in government at all levels, being single, and having high levels of concern before the experimental manipulation. Note that the experimental manipulations have almost no impact on these comparative risk judgments. Getting the enhanced citizen participation management option slightly reduced overestimates of involuntary risks. These overestimates, nevertheless, are high. This in spite of the fact that some of these comparisons were graphically presented in the information provided respondents. There could be no more dramatic information confirming the relative absence of impact of the risk communication itself.

Table XII-5: Regression Analysis for "Voluntary Risks."

VOLUNTARY RISK AS THE DEPENDENT VARIABLE

Ind. Vars.	Multiple R	R^2Change	Simple R	Beta
EDUCATION	.398	.159	-.557	-.364
TRUST GOVERNMENT	.479	.070	-.233	-.190
PRIOR CONCERN	.508	.029	.544	.137
TRUST LOCALS	.525	.018	-.288	-.109
FEMALE GENDER	.533	.008	.364	.084
AGE	.534	.006	-.146	-.086
MARRIED	.545	.007	-.555	-.127

Multiple R = .55
R^2 = .30

Table XII-6: Regression Analysis for "Life Risks."

LIFE RISKS AS THE DEPENDENT VARIABLE

Ind.Vars.	Multiple R	R^2Change	Simple R	Beta
EDUCATION	.300	.090	-.300	-.290
TRUST LOCALS	.351	.033	-.201	-.149
MARRIED	.390	.029	-.115	-.223
INCOME	.399	.008	-.060	-.101
PRIOR SICKNESS	.409	.008	-.053	-.104
PRIOR CONCERN	.402	.009	.100	.086
POSSIBLE TO CONTROL	.427	.006	-.150	-.101
CITIZEN PARTICIPATION MANAGEMENT OPTION	.433	.005	-.050	-.057

Multiple R = .43
R^2 = .19

Tables XII-7 and XII-8 present the regression of the four major independent variables on both the health risk assessments of voluntary and life-risks. Once again, the pattern of results for the two types of risk are quite consistent. Demographics account for the brunt of variance. In particular, the level of education produces the largest effects. The lesser educated are more likely to overestimate the danger of the site, even after variance for trust and prior attitudes and involvement is taken into consideration. However, trust and prior attitudes and involvement still account for significant variation. The consistency of the impact of trust is impressive.

Table XII-7: Regression Analysis for "Voluntary Risks" with the Four Major Independent Variable Sets.

(NOTE: Explained variance with all variables included = 32%)

	Multiple R
ALL VARIABLES	.57
PRIOR ATTITUDES AND INVOLVEMENT	.36
TRUST	.35
DEMOGRAPHICS	.46
RISK COMMUNICATIONS & MANAGEMENT OPTIONS	.10
ALL, MINUS PRIOR ATTITUDES AND INVOLVEMENT	.54
ALL, MINUS TRUST	.51
ALL, MINUS DEMOGRAPHICS	.40
ALL, MINUS RISK COMMUNICATIONS & MANAGEMENT OPTIONS	.56

Additional Explained Variance Accounted for by Variable Set

PRIOR ATTITUDES AND INVOLVMENT	3%
TRUST	6%
DEMOGRAPHICS	16%
RISK COMMUNICATIONS AND MANAGEMENT OPTIONS	1%
SHARED VARIANCE	6%

Accounting for the Behavioral Intentions

As noted previously, behavioral intentions form one overall scale termed "Action" and four subscales:

*"talk" is a three variable scale including the respondent's intention to get more information, to talk with others about the situation, and to serve on a commitee if needed;

*"personal" is a three variable scale including the respondent's intention to buy bottled water, to install a water treatement system, and to move out of the area;

Table XII-8: Regression Analysis for "Life-Risk" with the Four Major Independent Variable Sets.

(NOTE: Explained variance with all variables included = 20%)

	MULTIPLE R
ALL VARIABLES	.45
PRIOR ATTITUDES AND INVOLVEMENT	.18
TRUST	.25
DEMOGRAPHICS	.37
RISK COMMUNICATIONS AND MANAGMENT OPTIONS	.10
ALL, MINUS PRIOR ATTITUDES AND INVOLVEMENT	.43
ALL, MINUS TRUST	.40
ALL, MINUS DEMOGRAPHICS	.31
ALL, MINUS RISK COMMUNICATIONS & MANAGEMENT OPTIONS	.44

Additional Explained Variance Accounted for by Variable Set	
PRIOR ATTITUDES AND INVOLVEMENT	2%
TRUST	4%
DEMOGRAPHICS	10%
RISK COMMUNICATIONS AND MANAGMENT OPTIONS	1%
SHARED VARIANCE	3%

*"others" is a three variable scale including convincing others to buy bottled water, convincing others to leave, and going door to door to get others involved; and,

*"political" is a five variable scale including speaking up at public meetings, marching, writing members of Congress, organizing a protest meeting, and testifying at a public hearing.

Table XII-9 presents the order of variables, the direction of the relationship, and the summary coeffícents for the five scales. This summary is presented because of the significant overlap in each scale.

Table XII-9: Order of Variables and Summary Coefficients for the Five Behavioral Intention Scales.

THE SCALES

Action	Talk	Personal
PRIOR CONCERN +	PRIOR CONCERN+	TRUST LOCALS-
TRUST LOCALS-	MARRIED +	AGE+
INDEMNIFICATION+	INDEMNIFICATION+	FEMALE GENDER+
MARRIED+	POSSIBLE TO CONTROL-	PRIOR CONCERN+
PRIOR INVOLVEMENT+	PRIOR INVOLVEMENT+	POSSIBLE TO CONTROL+
UNCERTAINTY DISCL.+	AGE+	PRIOR SICKNESS+
RELIGIOUS SERV.-	TRUST LOCALS-	INDEMNIFICATION+
TRUST GOVT.-	RELIGIOUS SERV.+	SCIENCE KNOWS-
Mult. R=.40 R^2=.17	Mult. R= .44 R^2= .20	Mult. R= .40 R^2= .17

Others	Political
PRIOR CONCERN+	PRIOR CONCERN+
TRUST LOCALS-	INDEMNIFICATION+
INDEMNIFICATION+	PRIOR INVOLVEMENT+
POSSIBLE TO CONTROL-	TRUST GOVERNMENT-
PRIOR INVOLVEMENT+	KNOW CHEMICALS+
SCIENCE KNOWS-	RELIGIOUS SERV.-
FEMALE GENDER+	TRUST LOCALS-
	SCIENCE KNOWS-
Mult. R= .47 R^2= .22	Mult. R= .34 R^2= .12

Table XII-10 is also a summary table presenting the additional explained variance of each of the major independent variables for the five "action" dependent variables.

Table XII-10: The Additional Explained Variance for Each of the Major Independent Variable sets for Each Behavioral Intention.

	Actions	Talk	Personal	Others	Political
PRIOR ATTITUDES	7%	12%	2%	12%	7%
TRUST	5%	2%	6%	5%	2%
DEMOGRAPHICS	2%	2%	5%	0%	1%
RISK COMM. & MANAG.	2%	1%	1%	1%	1%
SHARED VARIANCE	1%	3%	3%	4%	1%
EXPLAINED VARIANCE	17%	20%	17%	22%	12%

Several findings emerge from these tables

*The overall amount of explained variation in behavioral intentions is less than noted in previous tables. This is probably a result of overt behavior, varying in its demands for public boldness, being strongly related to personality variates and the possibility of sanctions from any number of sources including employers, friends, relatives, and acquaintances. These unmeasured variables may be accounting for much of the unexplained variation.

*Prior Attitudes has the strongest impact on overall variation with one minor exception: demographics and trust play a substantial role for "personal" actions. Those with less education and women are more likely to take personal actions.

*The indemnification management scenario appears as a significant variable in all of these scales. As noted previously, this option cued those respondents who received it that the problem was of sufficient magnitude to encourage them to act.

*Those of lower education are more likely to take personal action and talk, but not more likely to get politically involved or to take part in public behaviors. This is consistent with a corpus of studies demonstrating that higher levels of education are strongly associated with overt, public participation.

*Women are more likely to take personal actions and convince others to do the same, but are not likely to get involved in political or public activist behaviors.

*Believing that problems like this are difficult to control is positively associated with a number of activities as is believing that science does not know enough about problems like these.

*The greater the religious involvement the less likely people are to get involved in political, activist activities, and the more likely they are to get involved in talking about the problem.

Summary of Section XII

The following outlines the most dramatic findings noted above.

*The formal risk information manipulation had virtually no impact. People's judgments of relative risk are determined by beliefs and attitudes they bring with them to the situation.

*The indemnification managment scenerio acted as a "signal" that this problem is substantial and had an impact on people who received it. This result highlights the possible impact of all sorts of "signals" such as technicians in protective clothing, fences and signs to keep people out, and other visible clues.

*Trust in government, especially local government, is by far the the most important and consistent set of variables in accounting for risk estimates. This fact raises some interesting implications because agencies must work with local government yet have little control over their quality or the degree of trust they enjoy.

*Female gender is consistently related to overestimating risks. This may help explain why so many local protest groups are organized and led by women.

*Education is predictably related to accuracy of risk comparisons and the type of activity that people will join. Those with higher levels of education are more accurate in their risk estimates and more likely to be involved in overt, political activity. The better educated, however, have only slightly lower levels of concern.

*The belief that toxic waste sites are able to be controlled by existing managment techniques is consistently and predictably related to concerns and behavioral intentions. This is another belief brought to toxic waste problems that has an impact on peoples' judgments.

SECTION XIII: RESPONSES TO OPEN ENDED QUESTIONS

One problem with structured questionnaire formats is that they tend to define the situation for the respondent. Although the post-manipulation structured questions appeared to tap those dimensions of respondents' attitudes, beliefs and behavioral intentions that are central to assessing consistency between objective and subjective risk, a number of open-ended questions were posed at the end so the respondent could define the situation for himself or herself. In one sense, these open-ended questions are validity checks. They help us determine whether there is correspondence between our definition of the situation and that of the respondent and whether our interpretation of the results is reflected in the respondent's thinking. Four composite open-ended questions were posed at the end of the questionnaire. They started in very general terms, encouraging the respondent to structure his or her answer independently. In the face-to-face interviews these questions were asked verbally. The following constitute the open-ended questions:

*was there anything positive or negative which struck you in the information you were asked to read about the waste site;

*specifically, anything positive or negative about the "water advisory notice, (you may want to go back and glance at it again);

*specifically, anything positive or negative about the "management scenerio," (you may want to go back and glance at it again); and,

*what kinds of information should agencies like the Environmental Protection Agency (EPA) provide the public about such sites, (was there more information, or a different kind of information, that you would have preferred in reading about the hypothetical waste site)?

Results of the Analysis of the Open-Ended Questions

Although not every respondent answered every question almost 500 responses were provided. Many of the responses simply affirmed that the information was adequate and offered little of a critical or constructive nature. For example:

*"there was a lot to read but the information was interesting enough to keep me reading;" or,

*"the information presented a situation that was probably a typical one - examples such as that shown should sensitize the concerns of persons exposed.

However, the data did reflect recurrent themes and provided some valuable insights. The following reflect the most robust patterns in the responses.

*A full 40 percent of the respondents critically mentioned the length of time that the cleanup process took. No other single topic was mentioned more often or with such consistent negative evaluation. In some cases the respondent generalized to all bureaucracies and their relative inefficiency.

*Over 20 percent of the respondents alluded to their distrust of the agencies, industry, and/or government. Many responses were of a general nature, such as the following;

> "It gives a feeling of dishonesty on the part of all the agencies involved. I don't know that it is stated, but it is implied."

*Approximately 15 percent of the sample criticized the annual chance of death format. They wanted the long-term probability of getting any of a number of specific health problems.

*Almost 12 percent criticized the comparison of voluntary with involuntary risks. On the other hand, a few of the respondents liked the comparisons.

*Several people who got the management scenario that included enhanced citizen participation mentioned this in a positive vein. However, it did not appear to have a significant impact on their judgments.

*The more highly educated respondent was likely to want more information and more highly technical information while the lesser educated was more likely to assert that there already was too much information, "certainly more than anyone would want to read."

*Respondents frequently mentioned their fears of contaminated water. The point made was that water is a necessity and cannot be avoided.

*Approximately one-third of the respondents consistently stated, and implied, that even though the information provided was adequate they simply did not believe it. They wanted to know where the statistics came from and why anyone should believe that drinking the contaminated water was similar in level of risk to drinking diet soda.

*Finally, approximately 6 percent of the sample felt that the EPA should have acted more paternally right from the start. They felt that citizens should be ordered not to drink that water and that bottled water should have been provided.

Summary

Two themes dominate these open-ended remarks: government agencies take far too long to deal with problems and agencies, industry, and government cannot be trusted in cases like this. Some respondents attributed the time delays to general bureaucratic ineptitude but others attributed it to a lack of knowledge about how to clean up such a situation. Apparently the seriousness of the problem is indexed by the fact that it is officially defined as one and subsequent information is often viewed as part of a "cooling out" process or just plain lying. Many respondents are reasoning that if the problem were not a serious health threat, then there would not be government agencies involved and testing programs in progress. Any information that fails to affirm this perceived seriousness is viewed as misinformation.

Two common assertions from the risk communication literature were affirmed by the open-ended comments: comparisons of voluntary with involuntary risks are viewed by some respondents as silly or misleading; and, people want to know the long-term, chronic health effects and not just an annual chance of death.

SECTION XIV: SUMMARY AND IMPLICATIONS FOR RISK COMMUNICATION

This research was designed to illuminate some of the major factors affecting consistency between objective and subjective risks in Superfund-like situations. Perhaps the most significant finding was the virtual absence of impact of the risk communication itself and the management scenerios. The lack of impact of an independent variable can always be attributed to a weak manipulation. In this case the uncertainty manipulation can clearly be a candidate for that accusation. Perhaps the information on uncertainty was insignificant given the plethora of other types of information, some of which were much more dramatic. However, the relative lack of impact of the management scenerios is less open to the charge of insignificance to the respondent. A large body of research argues strongly for the importance of citizen invovement in decision making in reducing fear and building trust. But, an analysis of the pre and post manipulation data, and the open ended material at the end of the research, demonstrates unequivocally that the these types of information were unable to compete with the beliefs and attitudes that the respondents brought with them to the situation. The following conclusions weave the net produced by this research.

*Most people enter a situation involving toxic waste problems with a dramatic lack of consistency between objective and subjective risk estimates. Almost everyone is highly concerned and a sizeable minority disproportionately attribute the incidence of a number of serious diseases to man-made toxic chemicals. Risk estimates are clearly related to levels of education. That means that it is certainly possible, through training, to bring the average citizen's risk estimates more in line with scientific risk estimates. However, education has no relationship to levels of concern. The implications are that even if subjective risk estimates are brought closer to scientific risk estimates it may have no bearing on public intransigence and distrust of government agencies involved in the cleanup.

*There is considerable skepticism about government, science, and the possibility of managing these kinds of problems safely. Skepticism of this scope makes communicator credibility highly problematic.

*Trust in local government scales with trust in industry, not with trust in state and federal governments. In addition, trust in local government is lower than trust in other levels of government. This result is identical with results found in surveys toward radioactive wastes (Bord, 1987). The problem for the EPA is that gaining the cooperation of local officials will not necessarily convince other citizens that their health and safety are being protected.

*Almost everyone is highly concerned with the situation, and for a sizeable minority the cleanup fails to reduce that concern.

*The extent to which the risk communication was either disbelieved or simply ignored is nothing short of remarkable. If the risk communication fails to reflect the subjective risk it is dismissed. Even those who evaluated the risk communication in a generally positive way did not use the information it contained in making their judgments.

*People overestimate the the risks associated with a toxic waste site in comparison with both voluntary, e.g., smoking, and involuntary, e.g., annual chest x-ray, risks. Fear of man-made toxins appears to involve well-formed attitudes and beliefs.

*The four elite groups (environmentalists, civic leaders, elected officials, and business people) are more alike than different on prior attitudes, level of concern, health risk and comparative health risk estimates, and trust. Elected officials are somewhat more trusting, but similarities are still more striking than differences. Perhaps everyone becomes an "environmentalist" in this kind of situation.

*Behavioral intentions scale from behaviors involving very little personal involvement and commitment to those that mean putting one's self on the line publicly. Almost everyone would get more information, about 66 percent would buy bottled water, about 50 percent would encourage others to buy bottled water, and approximately half would take political actions. Again, environmentalists do not differ from other elites on this issue.

*The variation in levels of concern are disproportionately explained by trust items. In fact, the trust items consistently explain a significant portion of the variance regardless of the dependent variable under analysis. In addition, when health related items form the dependent variable, then demographics, specifically gender and level of education, become important contributors to explained variance. In general, women are more fearful and more likely to assume harm coming to them or their families as a result of the contaminated site. The more highly educated are more likely to reflect levels of estimated health risks more consistent with scientific estimates. Their levels of both general and specific concern, however, mirror those of the less educated respondents.

*The other cluster of variables that explain a significant amount of variance in the dependent variables is the attitudes toward hazardous waste that people brought with them to the research setting. Prior attitudes and involvements in hazardous waste issues explain most of the variation in the behavioral intention items.

*The uncertainty manipulation and the variations in management scenarios had extremely small effects. At the bivariate level there is some indication that the uncertainty manipulation may have increased credibility to some extent. At the multivariate level the effect virtually disappears. The one management scenario that has a somewhat consistent, though small, impact on explained variance is the indemnification manipulation. Apparently the indeminification information is one more signal about how serious this problems really is. Respondents seem to be reasoning that if it were not extremely serious then this option would not be provided.

Implications for Risk Communications at Superfund Sites

First, the notion of the "signal potential" of certain stimuli is strongly supported in this research. The pictures of the leaking 50 gallon drums and of the technicians dressed in protective clothing plus the description of the contaminated site totally overwhelmed any other information. The data, both structured and unstructured, consistently indicated that those items of information communicated the "real" seriousness of the problems. Subsequent tables or statements were either ignored or viewed as lies. From the perspective of the layperson facing such a situation this makes a great deal of sense. Why would the government be here, and why would their people feel compelled to be so careful, if this situation were not a serious health threat. To then present data indicating the degree of threat is minimal is to present a contradiction. Government agencies must realize that their total pattern of behavior constitutes the risk communication. Serious consideration must be given to how to structure that pattern in ways that sends the kind of message the agency is trying to send. In one national meeting a noted risk communication expert was asked the most effective way to present risk information. He smiled and said, "Hire a good P.R. person." While that response may be taken as a cynical remark it may also reflect his understanding that risk communication is more than official notices or data structured in various ways. Messages are sent by behavioral styles, costumes, communicator attitude, certain kinds of trucks rumbling down city streets, fences and signs, leaking barrels, odoriferous and colored water supplies, and a host of other factors. Perhaps the image, the gestalt, is more crucial than the pieces of formal information released by the agency.

Second, the fact that so many people were bothered by the length of time it took to execute the cleanup must be taken into account. None of the information provided about the site communicated why the remedial process at Superfund sites cannot quickly be completed. From a risk communication perspective, it is important to ensure that expectations do not outrace realities. The social movement literature consistently calls our attention to the power of unrealistic expectations to generate outrage. The agency should consider providing additional information on the remedial process and how long most cleanups take. This information should be communicated early in the remedial process. Local citizens may not be happy with the projected length of the project, but they will not have to experience dashed hopes and the frustration associated with that.

The lack of trust, especially in industry and local government but also in science and people's ability to manage complex problems, indicates that communicator credibility and local representation are crucial issues. The data of this study indicate that concern with man-made toxins and the perception of imminent threat are indeed ubiquitous (O'Riordan, 1983). Therefore, anything an agency can do to appear forthcoming is likely to have more positive than negative outcomes. Although the uncertainty manipulation did not have a strong impact, it did appear to lessen post-manipulation fears somewhat. An admission, by an agency, of limited knowledge, along with an explanation of what it does know and how it knows it, may gain support among those who understand the process of science to some degree. Also, because local government often inspires so little confidence in situations like these, it is crucial to communicate information directly to concerned and affected citizens. There is much anecdotal evidence indicating that small, informal meetings run by trained EPA community relations specialists have reduced citizen fears at Superfund sites. These meetings are a form of increased community involvement. Large, officious public meetings that serve a cathartic function are of little value.

Perhaps the strongest message imbedded in this research is that waiting to communicate scientific-technological information until a hazardous waste response action has occured is simply too late. Education plays a significant role in the risk evaluations noted above. Risk communication has already taken place through the media, the schools, within interest groups, and between relatives and friends. Although much has been made recently about the need to teach humanities and classics in the schools a strong argument can and should be made that people also need to understand the technical environment in which they live. A public information program, sponsored by government and reaching down through the schools, would help citizens better understand their world and its problems and, hopefully, help them to make more informed decisions about that world. A broader public information program is consistent with the purposes and legislative history of both CERCLA and SARA.

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APPENDIX A

Hypothetical Site Scenario

Risk Communication

Management Options

INTRODUCTION TO THE MATERIAL ON THE HYPOTHETICAL WASTE SITE

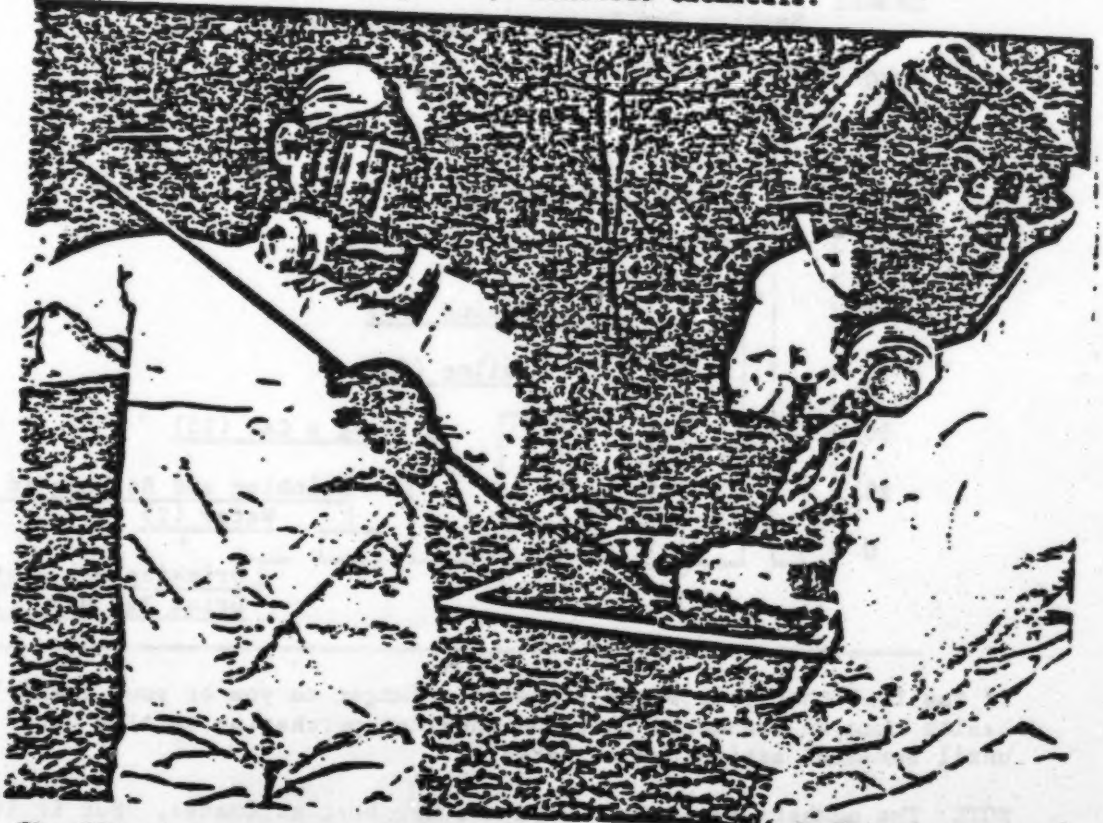
Now I would like to have you read some material dealing with an area which has the problem of hazardous chemical pollution. I want you to imagine that you live in the community in which this site is located. In fact, imagine that you live within one mile of the source of the contamination. After you have read the material you will be asked to answer some questions concerning your reactions to the hazardous chemical site.

Approximately two years ago people began noticing that the drinking water had an unusual smell to it. The local newspaper carried several letters from concerned citizens, some of whom complained of health problems which they thought might be linked to the possible contamination of local water supplies. For example, several members of one family have been suffering for about six months from an unexplained rash; two cases of childhood leukemia have been diagnosed in the same neighborhood during the past year, and a growing number of older people have had to seek professional help for arthritis.

Local officials contacted the Pennsylvania Department of Environmental Resources (DER) and requested testing of local water supplies. The tests indicated that the chemicals TCE (trichloroethylene) and benzene were present in the water at levels above those approved by the Environmental Protection Agency. The source of this contamination was traced to the site of a manufacturing plant which had gone out of business and had been torn down years ago. The old plant site now consists of trees, brush, timber, and a few marshy areas. There are several lagoons in which chemicals had been disposed of by the old manufacturing plant along with a number of decaying 50 gallon drums scattered about which are spilling their contents onto the soil. The photograph below was taken on part of the site.

The DER issued an advisory to all residents of the area serviced by water drawn from wells that had been contaminated by chemicals seeping through the soil. Your home is approximately one mile from the source of the chemicals and is serviced by water drawn from the contaminated wells.

Within two days EPA (Environmental Protection Agency) technicians appeared on the site of the old manufacturing plant. After collecting fresh soil samples, along with DER people, the EPA decided to build a new drainage ditch to divert water from the area of the barrels and the smelly lagoon into a new lagoon. This new lagoon was constructed so that it had a thick clay bottom along with a strong plastic liner. The EPA said that the new lagoon would keep more chemicals from seeping into the water supply and would control the situation until a more permanent solution could be devised. The EPA also fenced in the area where the manufacturing plant had stood and posted signs warning people not to trespass because of dangerous, hazardous chemicals.



The EPA also released the following water advisory to the press and sent copies to the homes of all homeowners serviced by the affected water supply:

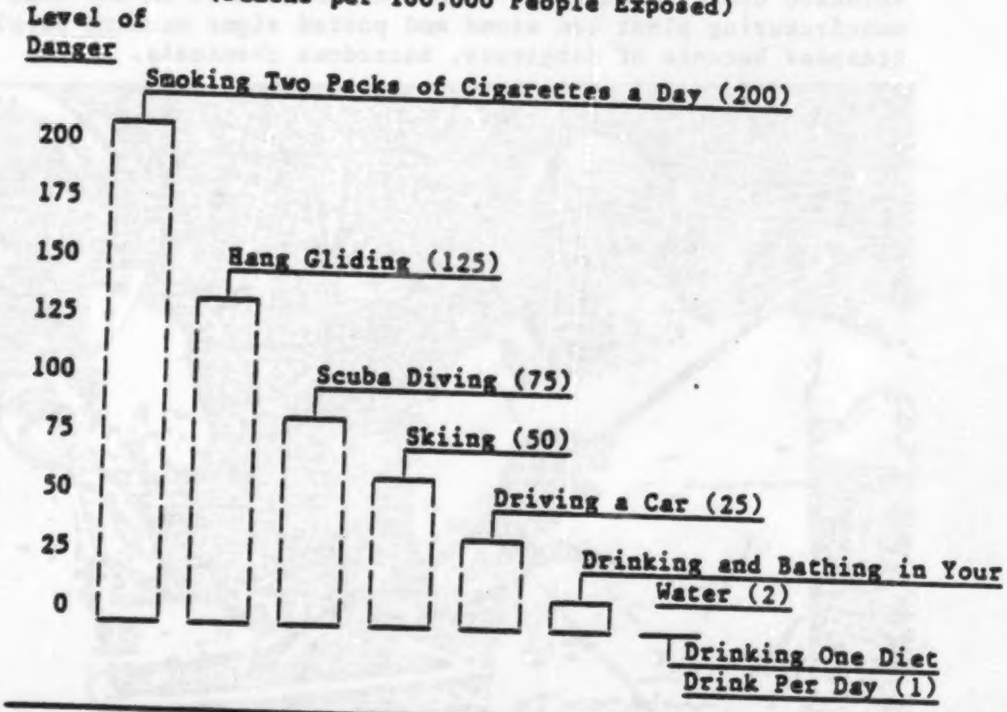
(With Disclaimer)

WATER ADVISORY NOTICE

Testing has determined that the local water supply contains unacceptably high levels of trichloroethylene (TCE) and benzene. These are chemicals commonly used in industry and as components of common household products such as cleaning agents, glues, paint strippers, and as an anti-knock additive in gasoline.

At high levels these chemicals may cause cancer, neurological impairment, liver and kidney damage, and possibly birth defects and miscarriages. The chart below illustrates the number of people who can be expected to die per year as a result of being exposed to your water for one year. Some other health hazards are included for comparison purposes.

ANNUAL CHANCE OF DEATH
(Assuming One Year of Exposure)
(Deaths per 100,000 People Exposed)



If you feel that your water presents a danger to you or your family's health then we recommend that you consider purchasing bottled water until remedial action can be taken.

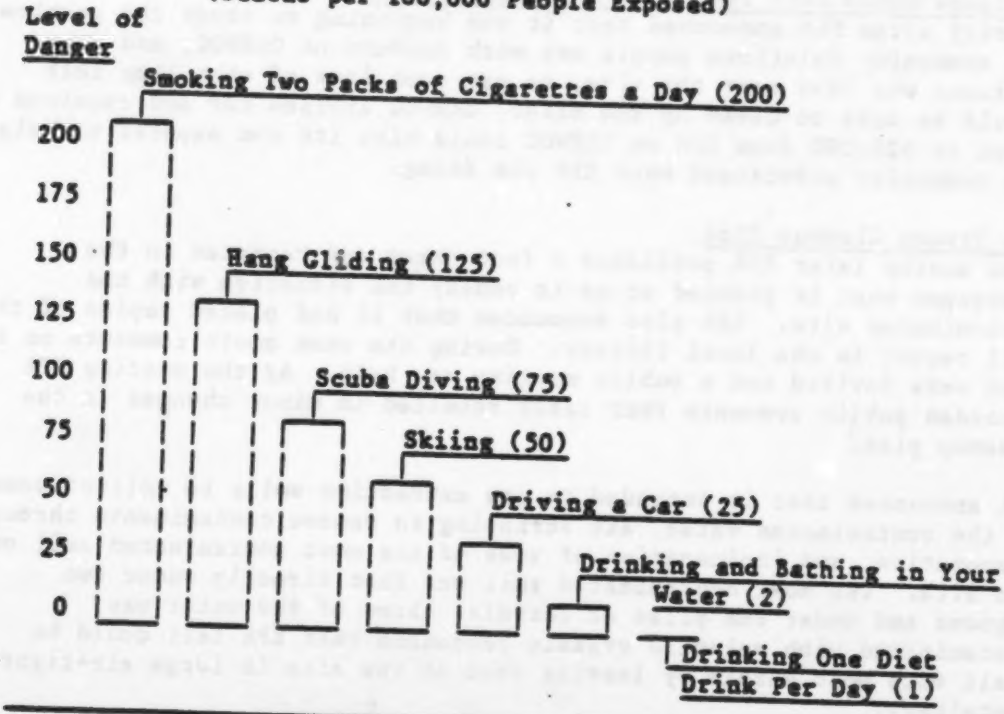
NOTE: The numbers presented above are our best estimates. But it is important to realize that they are only estimates. They are based primarily on research with laboratory animals, usually rodents, who are given extremely high doses of the chemical being tested. If the animal exhibits health problems, we then extrapolate from these high doses to the very low doses usually received by people who may be exposed to the chemical. The risk assessor chooses the assumption, or best guess, that appears least likely to underestimate the risks. An attempt is made to overestimate rather than underestimate risk. But it is an educated guess.

WATER ADVISORY NOTICE

Testing has determined that the local water supply contains unacceptably high levels of trichloroethylene (TCE) and benzene. These are chemicals commonly used in industry and as components of common household products such as cleaning agents, glues, paint strippers, and as an anti-knock additive in gasoline.

At high levels these chemicals may cause cancer, neurological impairment, liver and kidney damage, and possibly birth defects and miscarriages. The chart below illustrates the number of people who can be expected to die per year as a result of being exposed to your water for one year. Some other health hazards are included for comparison purposes.

ANNUAL CHANCE OF DEATH
(Assuming One Year of Exposure)
(Deaths per 100,000 People Exposed)



If you feel that your water presents a danger to you or your family's health then we recommend that you consider purchasing bottled water until remedial action can be taken.

(Standard)

MANAGEMENT SCENERIO

Eighteen months later you learned that the site had been added to the National Priorities List of hazardous waste sites which are eligible for cleanup funding under the federal Superfund program. Six months after that, the EPA announced that it was starting a remedial investigation and feasibility study to decide what to do about the barrels, liquids, and contaminated soils that remain behind the fences of the old plant.

Citizens Group Forms

At the same time that the site was being added to the National Priorities List a group of homeowners in the two neighborhoods adjacent to the site formed a group called "Citizens Against Hazardous Waste in our County" (CAHWOC). They expressed their dismay that the waste had not been removed in the 18 months since the initial problem was noted and that EPA refused to promise that the waste would be removed shortly. The group also was upset to learn that EPA would explore options that might leave some of the contaminants at the site and might burn contaminated substances on site.

Citizens Group Gets Technical Assistance Grant

Shortly after EPA announced that it was beginning to study the problem, EPA community relations people met with leaders of CAHWOC, and other citizens who live near the site, to get some idea of what they felt should be done to clean up the site. CAHWOC applied for and received a grant ot $20,000 from EPA so CAHWOC could hire its own experts to help the community understand what EPA was doing.

EPA Issues Cleanup Plan

Nine months later EPA published a fact sheet and reported in the newspaper what it planned to do to remedy the situation with the contaminated site. EPA also announced that it had placed copies of the full report in the local library. During the next month comments on the plan were invited and a public meeting was held. At the meeting EPA recorded public comments that later resulted in minor changes in the cleanup plan.

EPA announced that it intended to use extraction wells to collect some of the contaminated water, air stripping to remove contaminants through evaporation, and incineration of some of the most contaminated soil on the site. The most contaminated soil was that directly under two lagoons and under the piles of barrels. Some of the water was contaminated with volatile organic compounds that EPA felt could be dealt with most safely by leaving them at the site in large air-tight containers.

EPA Holds Public Hearing; Cleanup Commences

At the public hearing the experts employed by CAHWOC complained that they had some trouble getting answers to technical questions from EPA and that they agreed with some of the local residents who questioned the safety of incinerating some of the most contaminated soil. EPA experts argued that incineration was quite safe and far less expensive than digging up the contaminated soil and trucking it to an approved hazardous waste site. Four months later, heavy equipment moved in as EPA began to carry out its plan.

(Indemnification)

MANAGEMENT SCENERIO

Eighteen months later you learned that the site had been added to the National Priorities List of hazardous waste sites which are eligible for cleanup funding under the federal Superfund program. Six months after that, the EPA announced that it was starting a remedial investigation and feasibility study to decide what to do about the barrels, liquids, and contaminated soils that remain behind the fences of the old plant.

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Citizens Group Gets Technical Assistance Grant

Shortly after EPA announced that it was beginning to study the problem, EPA community relations people met with leaders of CAHWOC, and other citizens who live near the site, to get some idea of what they felt should be done to cleanup the site. CAHWOC applied for and received a grant of $20,000 from EPA so CAHWOC could hire its own experts to help the community understand what EPA was doing.

State Agrees to Buy Homes at Fair Market Value

Several citizens with homes close to the site expressed their fear that the value of their homes had been reduced by the negative publicity generated by the Superfund Site. Both EPA and DER representatives assured the citizens that, because there were no serious threats to health associated with their proximity to the site, their homes should be as valuable as ever. Under a special State experimental program, the State agreed to purchase the home of anyone within one mile of the site providing the individual had first tried to sell the property in the private marketplace and had been unable to get fair market value for it, at the rate of a comparable home not near the site, or could not sell it at all over a 12 month period. The State would pay the fair market value of comparable homes not in the vicinity of the site. The State, however, emphasized that the risks to health were not great enough that it would recommend that people move from the area.

EPA Issues Cleanup Plan

Nine months later EPA published a fact sheet and reported in the newspaper what it planned to do to remedy the situation with the contaminated site. EPA also announced that it had placed copies of the full report in the local library. During the next month comments on the plan were invited and a public meeting was held. At the meeting EPA recorded public comments that later resulted in minor changes in the cleanup plan.

EPA announced that it intended to use extraction wells to collect some of the contaminated water, air stripping to remove contaminants through evaporation, and incineration of some of the most contaminated soil on the site. The most contaminated soil was that directly under two lagoons and under the piles of barrels. Some of the water was contaminated with volatile organic compounds that EPA felt could be dealt with most safely by leaving them at the site in large air-tight containers.

EPA Holds Public Hearing; Cleanup Commences

At the public hearing the experts employed by CAHWOC complained that they had some trouble getting answers to technical questions from EPA and that they agreed with some of the local residents who questioned the safety of incinerating some of the most contaminated soil. EPA experts argued that incineration was quite safe and far less expensive than digging up the contaminated soil and trucking it to an approved hazardous waste site. Four months later, heavy equipment moved in as EPA began to carry out its plan.

(Augmented Citizen Participation)

MANAGEMENT SCENERIO

Eighteen months later you learned that the site had been added to the National Priorities List of hazardous waste sites which are eligible for cleanup funding under the federal Superfund program. Six months after that, the EPA announced that it was starting a remedial investigation and feasibility study to decide what to do about the barrels, liquids, and contaminated soils that remain behind the fences of the old plant.

Citizens Group Forms

At the same time that the site was being added to the National Priorities List a group of homeowners in the two neighborhoods adjacent to the site formed a group called "Citizens Against Hazardous Waste in our County" (CAHWOC). They expressed their dismay that the waste had not been removed in the 18 months since the initial problem was noted and that EPA refused to promise that the waste would be removed shortly. The group also was upset to learn that EPA would explore options that might leave some of the contaminants at the site and might burn contaminated substances on site.

Citizens Group Gets Technical Assistant Grant

Shortly after EPA announced that it was beginning to study the problem, EPA community relations people met with leaders of CAHWOC and other citizens who live near the site, to get some idea of what they felt should be done to clean up the site. CAHWOC applied for and received a grant of $20,000 from EPA so CAHWOC couls hire its own experts to help the community understand what EPA was doing.

EPA Agrees To Work With Advisory Committee

At the same time that CAHWOC received the grant, EPA also agreed to work with a citizen advisory committee made up of two members of CAHWOC, two other local people, one local official, a chemistry professor from a nearby college, and an expert from the State Department of Environmental Resources. This committee was given the right to review all EPA plans involving the site. In addition, EPA agreed that a majority of the committee had to approve any proposed solution before it could be put into effect.

EPA Issues Cleanup Plan After Reaching Agreement With Advisory Committee

Nine months later, EPA published a fact sheet and reported in the newspaper what it planned to do to remedy the situation with the contaminated site. EPA also announced that it had placed copies of the full report in the local library. In the months before the plan was officially published the citizen advisory committee had reviewed EPA proposals and discussed them with local citizens. With the advice of local people, the advisory committee insisted on several minor changes in the EPA plan as originally proposed. The final plan was a result of the combined effort of the EPA experts and the advisory committee.

EPA announced that it intended to use extraction wells to collect some of the contaminated water, air stripping to remove contaminants through evaporation, and incineration of some of the most contaminated soil on the site. The most contaminated soil was that directly under two lagoons and under the piles of barrels. Some of the water was contaminated with volatile organic compounds that EPA felt could be dealt with most safely by leaving them at the site in large air-tight containers.

EPA Holds Public Hearing; Cleanup Commences

At the public hearing the citizen advisory committee made it known that there had been some disagreement between them and the EPA over the issue of incinerating some of the soil. However, EPA experts argued that incineration was quite safe and far less expensive than digging up the contaminated soil and trucking it to an approved hazardous waste site. The citizen advisory committee eventually agreed with the EPA experts. Four months later, heavy equipment moved in as EPA began to carry out its plan.

APPENDIX B

Pre- and Post-Manipulation Questionnaires

INTRODUCTION

We are researchers affiliated with Penn State University. As you probably know, there is an ongoing Federal program designed to cleanup some of the more serious hazardous chemical waste sites across the United States. However, attempts to clean up these sites sometimes run into problems and take longer than they should. We want to explore, with you, some issues related to communicating risks related to hazardous waste sites. We will ask you to read some material and answer some questions related to that material. We will also ask you other questions concerning your opinions about dealing with toxic chemical wastes. This will take about one/half hour. All we are interested in is your beliefs and feelings about this important problem. Can you give us approximately a half hour of your time?

Thank you very much.

First, let me make it very clear that the issues we are going to ask you to respond to are taken from toxic waste sites across the country and are not something that is a local threat. This research has nothing to do with a real toxic waste site in your area. Do you have any questions about that?

Now, before I ask you to read some material on our make-believe site let me ask you some preliminary questions.

FIRST QUESTIONNAIRE

1. How concerned would you say you are with this issue of toxic chemical wastes sites? (Circle the appropriate number)
   VERY CONCERNED....................1
   SOMEWHAT CONCERNED...............2
   NOT TOO CONCERNED................3
   NOT CONCERNED AT ALL.............4

2. Here is a list of health problems that may be connected with exposure to chemicals. Would you indicate how concerned you are that you, or someone close to you, may suffer this problem because of exposure to chemicals in the air, soil, or water?

Tell me if you are:
GREATLY CONCERNED....(1)
SOMEWHAT CONCERNED...(2)
NOT TOO CONCERNED....(3)
NOT CONCERNED AT ALL.(4)
(Circle the appropriate number)

ADULT CANCERS	1	2	3	4
CHILDHOOD CANCERS	1	2	3	4
LIVER, KIDNEY, & BLADDER PROBLEMS	1	2	3	4
LUNG PROBLEMS (Not Cancer)	1	2	3	4
BIRTH DEFECTS	1	2	3	4
MISCARRIAGES	1	2	3	4
LEUKEMIA	1	2	3	4
SKIN PROBLEMS	1	2	3	4
OTHER SERIOUS CHILDHOOD DISEASES	1	2	3	4

3. Here are those same health problems listed above. Out of each 100 new cases diagnosed each year, how many would you estimate are caused by toxic chemicals from waste sites? For example, if you think that about 5 out of every 100 new cancers diagnosed in 1987 were caused by toxic chemicals from waste sites that would be your best guess. If you think it was 60 out of one hundred then 60 would be your best guess. If you think that toxic chemicals from waste sites do not cause any cancers you would pick 0 as your answer. I realize that you may not be an expert in this area, but give me your best estimate. REMEMBER: OUT OF EVERY 100 NEW CASES OF EACH HEALTH PROBLEM WHICH WERE DIAGNOSED LAST YEAR, HOW MANY DO YOU THINK WERE CAUSED BY TOXIC CHEMICALS FROM WASTE SITES?

ADULT CANCERS ____ (How many new cases out of 100 were caused by toxic chemicals from waste sites?)

CHILDHOOD CANCERS____ (How many new cases out of 100 were caused by toxic chemicals from waste sites?)

LIVER, KIDNEY, & BLADDER PROBLEMS____ (How many new cases out of 100 were caused by toxic chemicals from waste sites?)

LUNG PROBLEMS (NOT CANCER)____ (How many new cases out of 100 were caused by toxic chemicals from wastes sites?)

BIRTH DEFECTS ____ (How many new cases out of 100 were caused by toxic chemicals from waste sites?)

MISCARRIAGES ____ (How many new cases out of 100 were caused by toxic chemicals from waste sites?

LEUKEMIA ____ (How many new cases out of 100 were caused by toxic chemicals from waste sites?)

SKIN PROBLEMS ____ (How many new cases out of 100 were caused by toxic chemicals from waste sites?)

OTHER SERIOUS CHILDHOOD DISEASES ____ (How many new cases out of 100 were caused by toxic chemicals from waste sites?)

4. Are there any health problem we haven't mentioned that you think might be strongly related to toxic chemicals in the environment?

5. When it comes to the issue of toxic chemicals do you consider youself; (Circle the apropriate number)

WELL INFORMED............1
SOMEWHAT INFORMED........2
NOT VERY INFORMED........3
NOT INFORMED AT ALL......4

6. Do you think that you have suffered health problems due to exposure to hazardous chemicals in the water, soil, or air?
YES, I DEFINITELY SUFFERED HEALTH PROBLEMS FROM CHEMICALS..........1
I SUSPECT I HAVE SUFFERED HEALTH PROBLEMS BUT I'M NOT CERTAIN.......2
I DOUBT THAT I'VE SUFFERED HEALTH PROBLEMS FROM CHEMICALS...........3
NO, I DEFINITELY HAVE NOT SUFFERED HEALTH PROBLEMS FROM CHEMICALS...4

(If you answered "1" or "2" to the above question please answer question number 7. If you answered "3" or "4" go on to question number 8.)

7. If you think you have suffered health problems due to hazardous chemicals what is/was the nature of those problems?
____
____
____

What were the chemicals and where did they come from?
____
____
____

8. Have you ever heard of the chemical benzene? YES...1 NO...2
(If "yes" continue, if "no" go to question #9)

8a. Do you know where benzene comes from or what it is used for?
____

8b. Is benzene a health hazard? YES...1 NO...2 If "yes," what kind? ____
____

9. Have you ever heard of the chemical trichloroethylene or TCE?
YES...1 NO...2
(If "yes" continue, if "no" go to question #10)

9a. Do you know where trichlorethylene comes from or what is is used for?
____
____

9b. Is trichloroethylene a health hazard? YES...1 NO...2 (If "yes," what kind of hazard? ____________
____
____

10. Where do you get your information on the issue of toxic chemicals? (Circle as many numbers as are appropriate and respond to the questions to the best of your ability.)

1. I DON'T READ OR HEAR MUCH ABOUT THE SUBJECT

2. TELEVISION? Do you remember what program(s) your saw on this subject?
____
____

3. MAGAZINES? Specific magazines? ____________________

4. NEWSPAPERS? Specifics? ____________________

5. RADIO? Specifics? ____________________

6. OTHER SOURCES? ____________________

POST-QUESTIONNAIRE

1. How concerned would you be about living within one mile of this site prior to the cleanup attempt?

   EXTREMELY CONCERNED........................1
   SOMEWHAT CONCERNED.........................2
   NOT TOO CONCERNED..........................3
   NOT CONCERNED AT ALL.......................4

2. How concerned would you be about living within one mile of this site after EPA had completed the proposed cleanup plan?

   EXTREMELY CONCERNED........................1
   SOMEWHAT CONCERNED.........................2
   NOT TOO CONCERNED..........................3
   NOT CONCERNED AT ALL.......................4

3. How probable do you think it is that you would suffer health problems as a result of living near this site prior to the cleanup attempt?

   EXTREMELY PROBABLE........1
   SOMEWHAT PROBABLE.........2
   NOT TOO PROBABLE..........3
   NOT PROBABLE AT ALL.......4

4. How probable do you think it is that you would suffer health problems as a result of living near this site after EPA had completed the proposed cleanup?

   EXTREMELY PROBABLE........1
   SOMEWHAT PROBABLE.........2
   NOT TOO PROBABLE..........3
   NOT PROBABLE AT ALL.......4

5. How probable do you think it is that your family members would suffer health problems as a result of living near this site prior to the cleanup attempt?

   EXTREMELY PROBABLE........1
   SOMEWHAT PROBABLE.........2
   NOT TOO PROBABLE..........3
   NOT PROBABLE AT ALL.......4

6. How probable do you think it is that your family members would suffer health problems as a result of living near this site after EPA had completed the proposed cleanup?

   EXTREMELY PROBABLE.....1
   SOMEWHAT PROBABLE......2
   NOT TOO PROBABLE.......3
   NOT PROBABLE AT ALL....4

7. In cases like this, do you think that the company responsible for the contamination problem knew that their waste handling policies would eventually threaten public health?

   I THINK THEY KNEW FULL WELL WHAT WOULD HAPPEN.............1
   I THINK THEY HAD SOME IDEA THAT IT MIGHT CAUSE PROBLEMS...2
   I THINK THEY WERE NOT SURE WHAT MIGHT HAPPEN..............3
   I THINK THEY REALLY DID NOT KNOW WHAT WOULD HAPPEN........4

8. Below is a list of activities which may also involve a threat to a person's health and safety. Tell me how much of a threat you think drinking and bathing in the local water for one year is compared to each activity. MAKE YOUR JUDGMENT ON THE BASIS OF HOW MUCH OF A THREAT YOU THINK THE WATER WAS BEFORE THE EPA CLEANUP. For example, if you think that drinking and bathing in the local water for one year is about the same degree of threat as riding a bicycle every day for one year, you would circle number 3 (THE SAME).

	MUCH MORE OF A THREAT	SOMEWHAT MORE OF A THREAT	THE SAME	SOMEWHAT LESS OF A THREAT	MUCH LESS OF A THREAT
IS DRINKING THE LOCAL WATER MORE OR LESS OF A THREAT THAN SMOKING TWO PACKS A DAY FOR ONE YEAR? (Before Cleanup)	1	2	3	4	5
IS DRINKING THE LOCAL WATER MORE OR LESS OF A THREAT THAN LIVING NEAR A NUCLEAR POWER PLANT FOR ONE YEAR? (Before Cleanup)	1	2	3	4	5
IS DRINKING THE LOCAL WATER MORE OR LESS OF A THREAT THAN DRIVING A CAR FOR TWO HOURS A DAY FOR ONE YEAR? (Before Cleanup)	1	2	3	4	5
IS DRINKING THE LOCAL WATER MORE OR LESS OF A THREAT THAN RIDING A BICYCLE EVERY DAY FOR ONE YEAR? (Before Cleanup)	1	2	3	4	5
IS DRINKING THE LOCAL WATER MORE OR LESS OF A THREAT THAN HAVING ONE CHEST X-RAY IN ONE YEAR? (Before Cleanup)	1	2	3	4	5
IS DRINKING THE LOCAL WATER MORE OR LESS OF A THREAT THAN EATING FRUIT EVERY DAY FOR ONE YEAR WHICH WAS SPRAYED WITH PESTICIDES WHILE GROWING? (Before Cleanup)	1	2	3	4	5

9. Now here is that same list of activities that may be a threat to health and safety. Again, tell me how much of a threat you think drinking and bathing in the local water is compared to each activity. HOWEVER, THIS TIME, MAKE YOUR JUDGMENT ON THE BASIS OF HOW MUCH A THREAT YOU THINK THE WATER WAS AFTER THE EPA CLEANUP.

	MUCH MORE OF A THREAT	SOMEWHAT MORE OF A THREAT	THE SAME	SOMEWHAT LESS OF A THREAT	MUCH LESS OF A THREAT
IS DRINKING THE LOCAL WATER MORE OR LESS OF A THREAT THAN SMOKING TWO PACKS A DAY FOR ONE YEAR? (After Cleanup)	1	2	3	4	5
IS DRINKING THE LOCAL WATER MORE OR LESS OF A THREAT THAN LIVING NEAR A NUCLEAR POWER PLANT FOR ONE YEAR? (After Cleanup)	1	2	3	4	5
IS DRINKING THE LOCAL WATER MORE OR LESS OF A THREAT THAN DRIVING A CAR FOR TWO HOURS A DAY FOR ONE YEAR? (After Cleanup)	1	2	3	4	5
IS DRINKING THE LOCAL WATER MORE OR LESS OF A THREAT THAN RIDING A BICYCLE EVERY DAY FOR ONE YEAR? (After Cleanup)	1	2	3	4	5
IS DRINKING THE LOCAL WATER MORE OR LESS OF A THREAT THAN HAVING ONE CHEST X-RAY IN ONE YEAR? (After Cleanup)	1	2	3	4	5
IS DRINKING THE LOCAL WATER MORE OR LESS OF A THREAT THAN EATING FRUIT EVERY DAY FOR ONE YEAR WHICH WAS SPRAYED WITH PESTICIDES WHILE GROWING? (After Cleanup)	1	2	3	4	5

10. Here is a list of things that people can do in situations like this. For each activity, select that option that reflects how likely it is that you would engage in that activity.

OPTIONS

I DEFINITELY WOULD DO THIS.......1
I PROBABLY WOULD DO THIS.........2
I PROBABLY WOULDN'T DO THIS......3
I DEFINITELY WOULD NOT DO THIS...4

LIST

TRY TO GET MORE INFORMATION ABOUT THE NATURE OF THE PROBLEM ___

TALK ABOUT THE PROBLEM WITH FAMILY AND FRIENDS ___

TRY TO CONVINCE FRIENDS AND RELATIVES TO USE BOTTLED WATER ___

SPEAK UP AT A PUBLIC MEETING WHICH INCLUDES EPA OFFICIALS ___

MARCH IN A PROTEST PICKET LINE, EVEN IF IT MEANT BEING ARRESTED ___

TRY TO CONVINCE FRIENDS AND RELATIVES TO MOVE OUT OF THE AREA ___

SERVE ON A COMMITTEE OF CONCERNED CITIZENS ___

GO DOOR TO DOOR TO CONVINCE YOUR NEIGHBORS TO GET MORE INVOLVED IN THE PROBLEM ___

WRITE OR CALL MY CONGRESSMAN TO GET EPA TO REMOVE ALL THE WASTE IMMEDIATELY ___

ORGANIZE A MEETING TO PROTEST THE WAY THE PROBLEM IS BEING HANDLED ___

TESTIFY AS A CONCERNED CITIZEN AT A LEGAL HEARING ___

BUY BOTTLED WATER ___

HAVE A WATER TREATMENT SYSTEM INSTALLED AT MY OWN EXPENSE ___

MOVE OUT OF THE AREA AS SOON AS POSSIBLE ___

SUE ___

11. Thinking back over that list of activities you just went over, to what extent would those people who are most important to you support you in those activities?

THEY WOULD PROBABLY SUPPORT ME IN EVERYTHING, EVEN MARCHING IN PUBLIC PROTESTS OR BRINGING A LAW SUIT..................1

THEY WOULD PROBABLY SUPPORT ME TO SOME EXTENT, AS LONG AS I DIDN'T GET INTO TROUBLE....................................2

THEY PROBABLY WOULDN'T CARE WHETHER I GOT INVOLVED OR NOT...3

THEY PROBABLY WOULDN'T SUPPORT ME AT ALL...................4

For the following items, select that answer which most closely reflects your opinion.

1. In your estimation, how much can you trust local officials to give you the truth in situations like this?
   YOU CANNOT TRUST THEM AT ALL.......1
   YOU CANNOT TRUST THEM VERY MUCH....2
   YOU CAN TRUST THEM SOMEWHAT........3
   YOU CAN TRUST THEM A LOT...........4

2. In your estimation, How much can you trust State officials, like the Department of Environmental Resources (DER), to give you the truth in situations like this?
   YOU CANNOT TRUST THEM AT ALL.......1
   YOU CANNOT TRUST THEM VERY MUCH....2
   YOU CAN TRUST THEM SOMEWHAT........3
   YOU CAN TRUST THEM A LOT...........4

3. In your estimation, how much can you trust Federal officials, like the Environmental Protection Agency (EPA), to give you the truth in cases like this?
   YOU CANNOT TRUST THEM AT ALL.......1
   YOU CANNOT TRUST THEM VERY MUCH....2
   YOU CAN TRUST THEM SOMEWHAT........3
   YOU CAN TRUST THEM A LOT...........4

4. Do you think that it is really possible to control a problem like this so that it presents little or no health threat to the community?
   YES, DEFINITELY...................1
   PROBABLY, AT LEAST I THINK SO....2
   PROBABLY, NOT.....................3
   NO, DEFINITELY NOT................4

5. In situations like this do you think the Federal Agencies use the most effective cleanup method available, the cheapest cleanup method available, or something that is in between?
   THE MOST EFFECTIVE METHOD, REGARDLESS OF COST............1
   AN EFFECTIVE METHOD WHICH MAY HAVE QUESTIONABLE ELEMENTS BUT PROVIDES PROTECTION AT MODERATE COST..............2
   THE CHEAPEST METHOD, WHETHER EFFECTIVE OR NOT............3

6. From the standpoint of environmental pollution, is the United States today more or less safe than it was 30 years ago?
   MUCH SAFER...........1
   SOMEWHAT SAFER.......2
   ABOUT THE SAME.......3
   SOMEWHAT LESS SAFE...4
   MUCH LESS SAFE.......5

7. Are federal government agencies, such as EPA, more or less honest today than similar government agencies 30 years ago?
   MUCH MORE HONEST........1
   SOMEWHAT MORE HONEST....2
   ABOUT THE SAME..........3
   SOMEWHAT LESS HONEST....4
   MUCH LESS HONEST........5

8. Are state government agencies, such as the Department of Environmental Resources (DER), more or less honest today than similar government agencies 30 years ago?
   MUCH MORE HONEST........1
   SOMEWHAT MORE HONEST....2
   ABOUT THE SAME..........3
   SOMEWHAT LESS HONEST....4
   MUCH LESS HONEST........5

9. In your estimation, do scientists know enough about the impact of chemicals on our health to adequately protect us?
   YES, THEY DEFINITELY KNOW ENOUGH............1
   I HAVE SOME DOUBT THAT THEY KNOW ENOUGH.....2
   I HAVE SERIOUS DOUBTS THAT THEY KNOW ENOUGH.3
   NO, THEY DEFINITELY DO NOT KNOW ENOUGH......4

10. Do you think that industries which use toxic chemicals are seriously interested in protecting public health?
   YES, IT IS ONE OF THEIR PRIMARY CONCERNS..................1
   THEY HAVE SOME INTEREST IN IT.............................2
   THEY HAVE LITTLE INTEREST IN IT...........................3
   THEY HAVE NO INTEREST IN IT AT ALL........................4

11. Do you think that the government agencies (federal/state) which are supposed to regulate the chemical industry are seriously interested in protecting public health?
   YES, IT IS THEIR MAJOR CONCERN............................1
   THEY HAVE SOME INTEREST IN IT..............................2
   THEY HAVE LITTLE INTEREST IN IT............................3
   THEY HAVE NO INTEREST IN IT AT ALL.........................4

PERSONAL INFORMATION

Finally, we need some backround information on you so that we know something about the kinds of people who participated in this research.

1. Your present age: _____ years.

2. Sex: MALE......1
FEMALE....2

3. Are you presently married?
YES......1
NO.......2

4. Do you have children?
YES......1
NO.......2
(If "YES," how many?_____

5. Do you own your own home?
YES....1
NO.....2

6. Are you presently:
EMPLOYED (FULL TIME)....1
EMPLOYED (PART TIME)....2
UNEMPLOYED..............3
RETIRED.................4
FULL-TIME HOMEMAKER.....5

7. If employed: Briefly describe the kind of work you do.
____
____

8. What is the highest level of education that you have completed? (Circle Number)
NO FORMAL EDUCATION..............................
SOME GRADE SCHOOL...............................1
COMPLETED GRADE SCHOOL..........................2
SOME HIGH SCHOOL................................3
COMPLETED HIGH SCHOOL...........................4
TECHNICAL OR OTHER POST-HIGH SCHOOL EDUCATION (NOT COLLEGE)...........................5
SOME COLLEGE....................................6
MAJOR?..7
COMPLETED COLLEGE...............................
MAJOR? ____8
SOME GRADUATE WORK..............................
MAJOR? ____9
A GRADUATE DEGREE..............................10
MAJOR? ____

9. Do you belong to any community groups such as the P.T.A., Kivanis, Elks, or others? YES___ NO___

If YES:
Which groups are you a member of?______________________

Do you attend meetings regularly?______________________

Do you hold any offices in these groups?______________________

10. Which of the following most accurately describes your frequency of attendance at religious services?
I DON'T ATTEND AT ALL.............1
I ATTEND SEVERAL TIMES A YEAR.....2
I ATTEND AT LEAST ONCE A MONTH....3
I ATTEND EVERY WEEK...............4
I ATTEND MORE THAN ONCE A WEEK....5

11. What was your approximate family income from all sources, before taxes, in 1987?
LESS THAN $9,999.......1
$10,000 TO $19,999.....2
$20,000 TO $29,999.....3
$30,000 TO $39,999.....4
$40,000 TO $49,999.....5
$50,000 TO $59,999.....6
$60,000 OR MORE........7

12. As far as you know, are there any toxic waste problems in your immediate area? YES __ NO ___
If YES, what is the nature of these problems?
____
____

Have you been personally involved in this issue? YES___ NO___
How? ____
____

13. Are there any controversial public policy issues, not related to toxic wastes, in your community? YES___ NO___

If YES, what is the nature of this issue?______________________
____

Have you been personally involved in this issue? YES___ NO___

If YES, how?____
____

14. Are you aware of any toxic waste site problems that have been discussed in newspapers, magazines, and T.V. shows? (Love Canal, for example). Specifics______________________
____

Any in your State?____
____

INTERVIEW QUESTIONS

1. Was there anything positive or negative which struck you in the information you were asked to read about the waste site?

2. Specifically, anything positive or negative about the "water advisory notice?"

You may want to go back and glance at it again.

3. Specifically, anything positive or negative about the "management scenerio?"

You may want to go back and glance at it again.

4. What kinds of information should agencies like The Environmental Protection Agency (EPA) provide the public about such sites.?

Was there more information, or a different kind of information, that you would preferred in reading about the hypothetical waste site?